United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture
Forest Service
and the Missouri
Agricultural
Experiment Station

Soil Survey of Ste. Genevieve County, Missouri

How To Use This Soil Survey

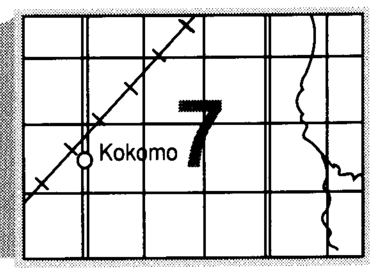
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

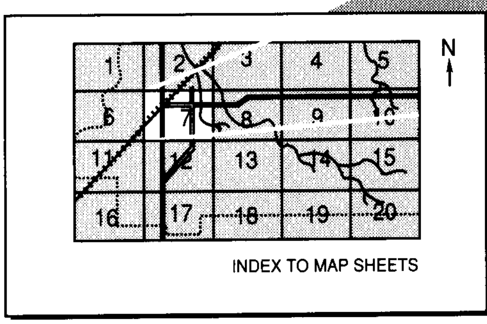
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



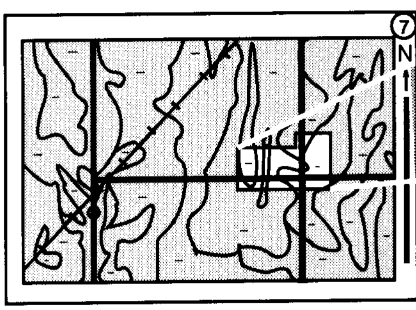
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



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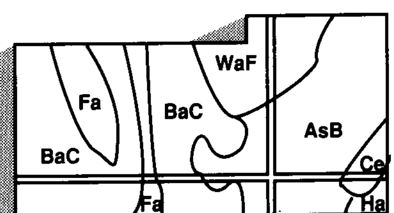

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This soil survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Missouri Agricultural Experiment Station. The Ste. Genevieve County Court provided monetary support and personnel to assist in the survey. This survey is part of the technical assistance furnished to the Ste. Genevieve County Soil and Water Conservation District. Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A landscape in Ste. Genevieve County showing contrast between the Fourche-Caneyville-Crider association in the foreground and the Lily-Ramsey association in the background. Abrupt soil boundaries are common in the county.

Contents

Soil Series

Issued April 1985

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Ste. Genevieve County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Paul F. Larson
State Conservationist
Soil Conservation Service

Soil Survey of
Ste. Genevieve County, Missouri

By Burton L. Brown and James D. Childress, Soil Conservation Service

Fieldwork by Burton L. Brown, James D. Childress, and
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Ste. Genevieve County Soil and Water Conservation District

United States Department of Agriculture,
Soil Conservation Service and Forest Service, in cooperation with
Missouri Agricultural Experiment Station

STE. GENEVIEVE COUNTY is in east-central Missouri (fig. 1). It is bordered on the east by the Mississippi River, Kaskaskia Island (a part of Randolph County, Illinois), and Perry County. It is bordered on the west by Jefferson and St. Francois Counties. The county is approximately 511 square miles, or 327,078 acres. The city of Ste. Genevieve, the largest urban area and county seat, is on the eastern edge of the county. In 1970, the population of the county was 12,867. The total urban population was 5,770.

The county has a variety of landforms, geologic formations, and surface features. Major faulting traverses the county in a southeast-northwest direction. Landforms roughly parallel the Mississippi River. They consist of nearly level stream bottom lands, rolling upland plains, and steep dissected plateaus.

Drainage is eastward directly into the Mississippi River, except for the extreme western and southern parts of the county. The drainage pattern consists of a series of somewhat parallel streams that have occasional interferences from resistant bedrock, faulting, and the resulting landforms. The general relief was initiated by early uplift and tilting of bedrock toward the east. The highest elevation is about 1,250 feet on the St. Francois County line, about 5 miles southwest of Coffman, and the lowest elevation is about 365 feet near St. Marys.

Farming is a major enterprise in the county, and about 62 percent of the county is in farms (*22*). Farms mainly are 50 to 500 acres, and general farming is common.

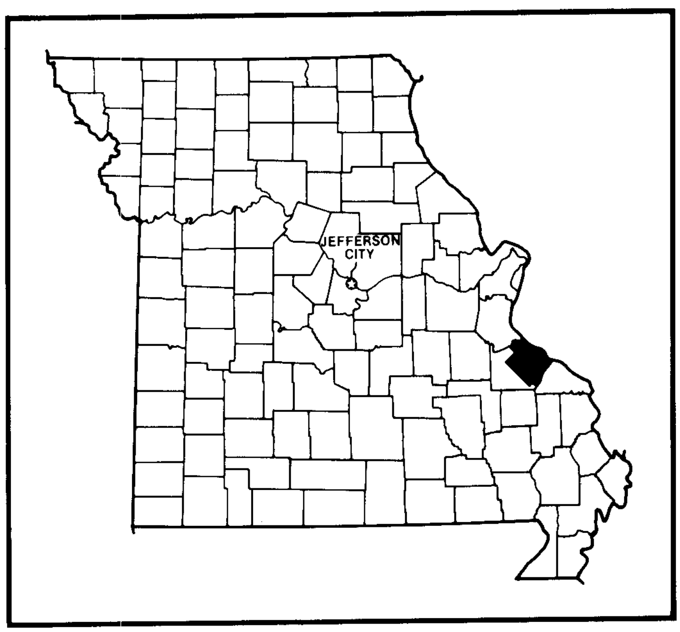

Figure 1.—Location of Ste. Genevieve County in Missouri.

Hogs, cattle, corn, and wheat are the main cash products; however, off-farm employment supplements

the income on a majority of farms. Nearly half the county remains forested. The woodland is mainly on steep or stony soils that generally are not suited to cropland. Most of the woodland is owned by farmers, and the wood products supplement other farm income.

General Nature of the Survey Area

In this section, climate, history and development, settlement, transportation, farming, and the physiography, relief, and drainage of the county are discussed.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The consistent pattern of climate in Ste. Genevieve County, Missouri, is of cold winters and long, hot summers. Heavy rains occur mainly in spring and early in summer, when moist air from the Gulf of Mexico interacts with drier continental air. The annual rainfall is normally adequate for corn, soybeans, and small grains.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Farmington, Missouri, in the period 1951 to 1979. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 34 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Farmington on January 11, 1977, is -23 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 14, 1944, is 108 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 22 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.95 inches at Farmington on June 30, 1957. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is 13 inches. The greatest snow depth at any one time during the period of record was 17 inches. On an average of 8 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, early in spring.

Tornadoes and severe thunderstorms occur occasionally but are local and of short duration. Damage varies and is spotty. Hailstorms occur at times during the warmer part of the year but in an irregular pattern and in only small areas.

History and Development

The first inhabitants of the survey area were probably bands of nomadic hunting and foraging Indians. Evidences of their presence have been found along the Mississippi River and its tributaries. The agricultural village dwellers of the Mississippian culture built the mounds that are still conspicuous in the Big Field (*8*) and along streams in the county.

Probably the first explorers to come into the area were in the Marquette and Joliet expeditions (*8*). They came down the Mississippi River from Canada to the mouth of the Arkansas River in 1673. In December 1681 another explorer, LaSalle, left Canada and reached the mouth of the Mississippi in April 1682. This expedition made note of Saline Creek, Salt Spring, and the high cliffs above present-day Ste. Genevieve.

Ste. Genevieve became the first French settlement west of the Mississippi River concurrent with Renault opening Mine La Motte in 1723. The first town of Ste. Genevieve was situated in LeGrand Champ (Big Field) until 1785, the year of the great flood. It is said that the river extended from bluff to bluff during this flood. The residents of the town were forced to move into the adjoining hills to the present location of Ste. Genevieve. Ste. Genevieve was an important commercial town. Lead, copper, nickel, cobalt, and iron were transported from areas to the west to Ste. Genevieve to be loaded onto keelboats for transportation on the Mississippi and Ohio Rivers.

France was the first European country to claim the survey area, which was part of the Louisiana Territory. Spain took possession after the French and Indian War. After 35 years of Spanish rule, the Territory was returned to France. After the United States bought the Territory in 1803, Americans began to emigrate in increasing numbers.

In 1812, Missouri was organized into a territory with a governor and a general assembly. Ste. Genevieve County was one of the original five counties. Missouri was admitted to statehood in 1821.

Settlement

People of French descent continued to be dominant until the immigration wave of 1825-1845. During this period, German immigrants came into Ste. Genevieve County, and by the middle of the 19th Century, there were far more German immigrants than French.

Farming in the county gradually gained precedence over the mining activities. Big Field continued to be the center of crop production. The German immigrants cleared and farmed the land to the west and established settlements such as Weingarten, New Offenburg, Zell, Ozora, and River Aux Vases. Communities such as Minnith, Coffman, Sprott, and Kinsey in the western part of the county were settled mainly by people from Virginia, Tennessee, and Kentucky.

Transportation

Although the Mississippi River played an important part in the settlement of Ste. Genevieve County, overland transportation was necessary for the development of the western part of the county.

The oldest road in Missouri followed an early Indian trail between Mine La Motte and the old settlement of Ste. Genevieve (*14*). This trail, known as the Three Notch Trail, was used to transport lead to Ste. Genevieve, probably as early as 1723. The King's Highway, constructed in 1808 because of an act of the territorial legislature, connected Ste. Genevieve with St. Louis, Cape Girardeau, and New Madrid. In 1851, a plank road was constructed to transport iron ore from Iron Mountain and Pilot Knob to Ste. Genevieve. This road was discontinued in 1857 after the St. Louis-Iron Mountain Railroad was built. Other railroads traversed Ste. Genevieve County, greatly enhancing its commerce and transportation. Today, hard surfaced roads and highways service all parts of the county. Interstate 55, crossing the county, is a major national transportation artery.

Farming

In 1974, the number of farms in the county was 745. The average size farm was about 260 acres. Of the total area, about 49 percent is forest, 22 percent is pastureland, and 20 percent is cropland. Forest is steadily declining because of the increasing demand for pasture, cropland, and urban land. The number of cattle in the county increased from 9,500 in 1928 to 32,600 in 1978. The number of hogs increased from 18,600 in 1927 to 39,400 in 1977. The number of chickens grew from 62,800 to 386,800 in the period from 1964 to 1974.

Crop acreage and yields have fluctuated rather drastically during the last half century but the general trend is upward, especially yields. Harvested corn average in 1927 was 18,700 acres yielding 34 bushels per acre; harvested corn average in 1977 was 16,800 acres yielding 82 bushels per acre. Over a 25-year span, soybean acreage increased from 100 acres in 1952, yielding an average 21 bushels per acre, to 6,600 acres in 1977, yielding an average 33 bushels per acre.

Other major crops in the county in 1979 included 8,200 acres of wheat, 700 acres of grain sorghum, and 17,900 acres of hay.

Physiography, Relief, and Drainage

An appreciation of the diversity of soils and their pattern of occurrence in the landscape would not be complete without an understanding of the physiographic features of the county (fig. 2). Many geologic formations have been identified and described (*9, 23*). Different kinds of rock, past forces active in geologic erosion, and drainage patterns have contributed to the landforms and surface features.

The diversity of physical features is apparent in the six major landforms in Ste. Genevieve County. The landforms are the Farmington Plain, the Salem Plateau, the Zell Platform, the River Hills, the Karst Plain, and the flood plain of the Mississippi River and other streams of the county.

The Farmington Plain consists of a rolling and partially dissected basin with low hills and broad ridges in the western part of the county. It is bounded on the east by the Avon escarpment and extends into St. Francois County on the west. It contains a central core of sandstone surrounded by the overlying dolomite. A small amount of igneous rock is exposed by stream entrenchment. The topography is generally smooth and has a broad ridge formed by the Farmington anticline that divides the drainage between east- and west-flowing streams (*11*). Exceptions to these smooth features are the narrow gorges, canyons, and steep bluffs that are common on some of the creeks and streams flowing away from the divide (fig. 3). The sandstone and dolomite formations represent early sedimentary deposits. Caneyville, Crider, and Fourche soils formed in clayey material overlying the dolomite. Jonca, Lily, and Ramsey soils formed in the loamy material overlying the sandstone.

The Salem Plateau is a distinctive higher area dissected by numerous streams and hollows. Its defined boundaries are the Avon escarpment on the west and the Crystal escarpment on the east. The narrow ridgetops are about the same elevation and are remnants of the original plateau surface. They represent the oldest land surface in the county and are part of an extensive sedimentary plain or base level that encompasses the entire Ozark region. The dissected side slopes expose the thick cherty red clays and some cherty dolomite bedrock. Goss soils formed in the cherty red clays on the steeper slopes. The more stable ridgetops are occupied by Hildebrecht, Union, and Wilderness soils that have a well formed fragipan.

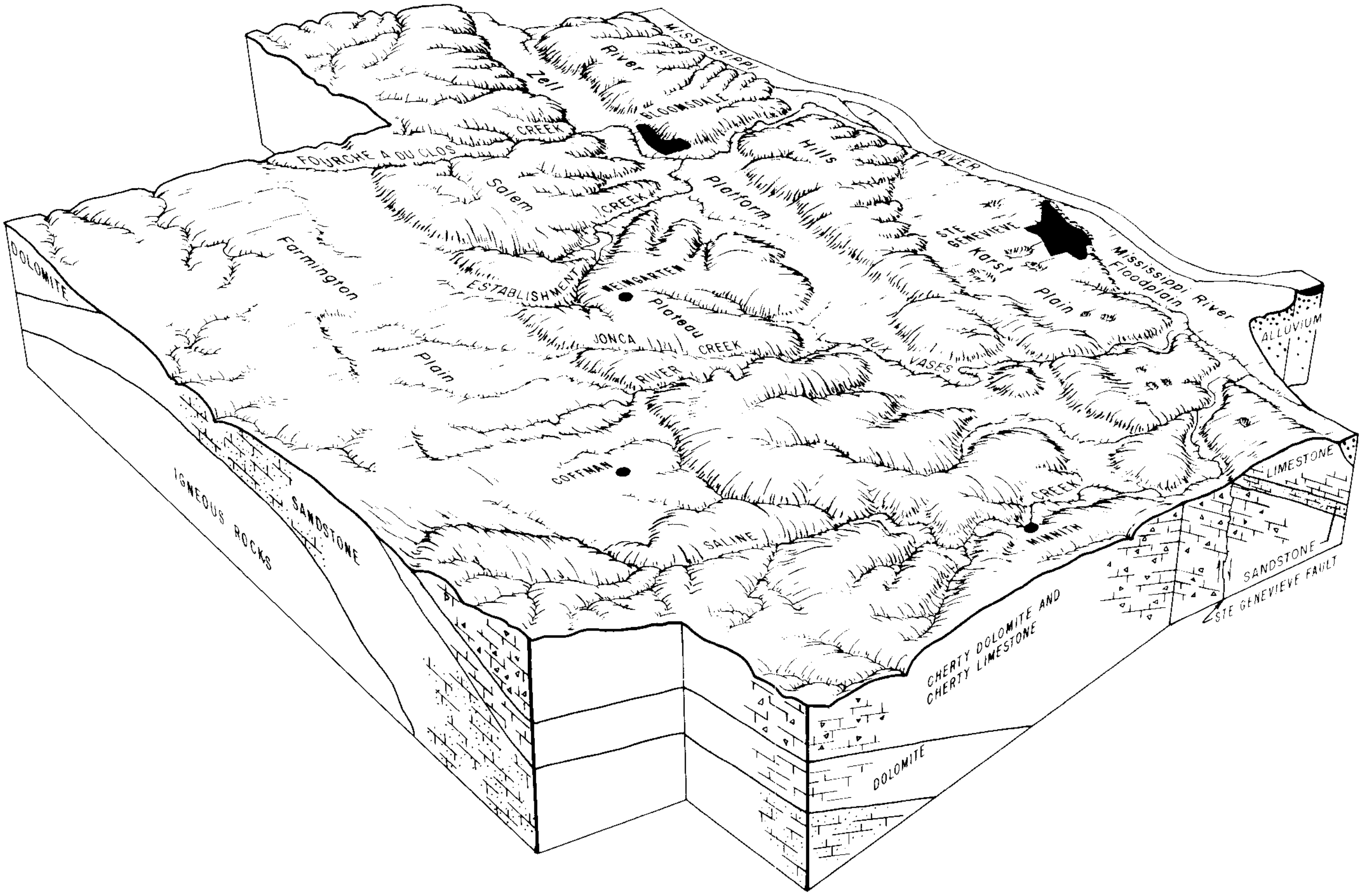

Figure 2.—Physiographic relief and drainage of Ste. Genevieve County.

Weingarten soils occupy positions in the eastern half of the area.

The Zell Platform is a long, narrow valley with rolling topography. It enters the northern part of the county and extends southeastward across the county. The Crystal escarpment is on the west, and the Burlington escarpment is on the east. The Zell Platform averages about 2 miles wide, and the major drainage patterns are across the valley at right angles. In the southern part of the county it is interrupted by a zone of block faulting, and the entire valley may be related to the effect of strike faulting. About 15 miles of Interstate 55 is in this valley. The underlying bedrock is mostly sandstone and in some places is dolomite and limestone. The major soils in this area are Minnith and Menfro.

The River Hills consist of a narrow band of high uplands bounded on the west by the Burlington escarpment and on the east by the Mississippi River flood plain and the Karst Plain. This area is dissected by the River Aux Vases and various other creeks and smaller streams. The northern end, known as the Brickey Hills, is characteristic of this major landform and has steep side slopes, narrow ridges, and deep, narrow hollows. The ridges and east-facing slopes are blanketed with thick loess. The west-facing slopes are cherty red clays on the upper side slopes and limestone outcrop on the lower side slopes. Gasconade, Goss, Menfro, and Weingarten are the major soils in this area.

The Karst Plain is a band of upland about 5 miles wide extending from Frenchman Hollow southward into Perry County near St. Marys. It is bordered on the west by a gradual ascent to the River Hills and on the east by the Mississippi River flood plain. The Karst Plain is characterized by sinkholes and sinkhole ponds. Thick loess covers the area, and the underlying bedrock is predominately limestone. Near St. Marys and to the north is a prominent ridge where the soils are underlain by sandstone. Menfro soils are dominant in the Karst Plain.

Flood plains of the Mississippi River and secondary streams and the terraces accompanying the flood plains make up this major landform. The secondary streams

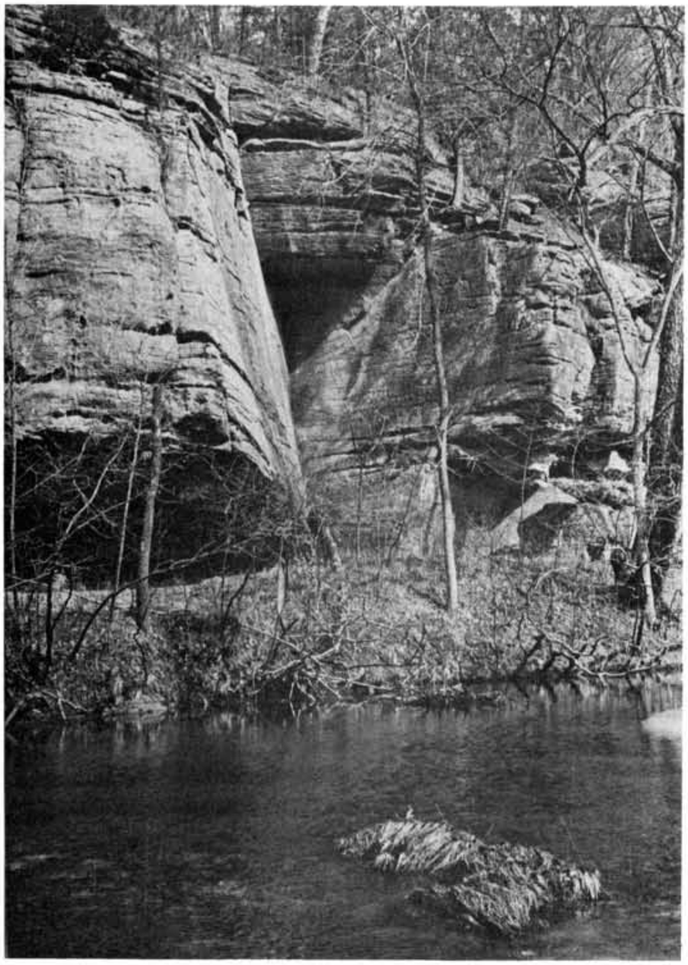

Figure 3.—Sandstone cliffs along the River Aux Vases are typical of stream entrenchment associated with the Farmington anticline. The cliffs are included in Ramsey stony loam, 14 to 35 percent slopes.

include Establishment Creek, River Aux Vases, Saline Creek, and numerous smaller streams. The small flood plains invariably consist of gravelly material in the upper reaches of smaller streams. Downstream, the gravelly material forms continuous beds that underlie other alluvium as basal deposits. Deposited on the gravelly material and increasing in thickness downstream is loamy and silty alluvium. Midco, Bloomsdale, Ross, Haymond, and Wilbur soils formed in these materials. Loamy, silty, and clayey alluvium was deposited on the Mississippi River flood plain. Carr, Haynie, Nameoki, and Wabash soils formed in these materials.

Several distinct regional base levels are identified in Ste. Genevieve County, although their identity has been greatly complicated by subsequent events. Elevations alone are not good indications of the original landforms because of the general tilting of the county, the easterly dipping of the bedrock, and the apparent faulting that interrupts altitudes and continuity. However, the Salem Plateau and River Hills as defined in this report are possibly of the same original base level. The Zell Platform and the Karst Plain have similar relief and may belong to the same secondary base level. The Farmington Plain is somewhat isolated by faulting, general uplift, tilting, and folding but may have originally been part of this secondary level. Other minor and more temporary levels are indicated by at least three terrace levels along the Mississippi River and its tributary streams. The upper terrace or bench, represented by the Freeburg soils, has a rather stable elevation of about 400 feet. The other two terrace levels are lower, where all are present in sequence, but have a wide range of elevations. Ashton and Auxvasse soils are on these positions. These terraces are ancient shorelines or strand lines. The upper terrace is a general base level that can be identified outside the county in areas of similar elevation. The lower terraces were deposit controlled by the Mississippi River and in many instances were cut by its tributaries. They occur only in connection with the river and slope according to its gradient.

Drainage in most of the county flows directly into the Mississippi River. The drainage is in a northeasterly direction, which generally coincides with the dip of the bedrock. The streams that begin in the Farmington Plain flow through narrow water gaps as they cross the Avon escarpment. In places, geologic structure has influenced the pattern of stream development. Pinhook Hollow, near Lawrenceston, is an example. Here, the general northeasterly stream flow is interrupted by a 2 mile section of the stream that flows northwest along a fault system.

In the western part of the county, within the Farmington Plain, the higher elevations form a major drainage divide. This dividing ridge lies roughly in a line from Thurman to Womack. Drainage east of this line is to the Mississippi River. Drainage west of this line is either northwest to the Big River or southwest to the St. Francis River. The drainage divide between the latter two rivers lies roughly in a line from Wiggens Hill in adjacent St. Francois County to the vicinity of Sprott.

A small upland ridge in the southernmost part of the county near Womack is the headwaters of the Castor River. Here surface drainage is toward the south.

There are several sinkhole areas in the eastern part of the county where surface drainage patterns are not well expressed. Water enters underground drainage systems through sinkholes, short streams that enter underground caverns, or by seepage through the soil. Some of this water later surfaces as springs or by resurgence.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, characteristics of the soils gradually change, and individual soils on the landscape merge into one another. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas, or soil associations, that have a distinctive pattern of soils, relief, and drainage. This map unit is generally consistent with the general soil maps of Missouri (*21*). Each soil association on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Descriptions, names, and delineations of soils in this survey do not fully agree with soil maps of adjacent counties published at a different date. Differences are the result of additional soil data, intensity of mapping, publication scale, and correlation decisions that reflect local variations. In some places it is more feasible to combine small acreages of similar soils that respond to use and management in much the same way than it is to separate these soils and give them different names.

Dominantly Deep Soils Formed in Residuum or Other Cherty Material and Loess

These soils formed in cherty clay or other cherty material, or in loess, or in loess and the underlying cherty material. The underlying bedrock consists mainly of cherty dolomite and cherty limestone. These soils are on hills throughout the central part of the county. They make up about 48 percent of the county. The soil associations in this group differ in kinds of soil and in topography.

Mixed hardwoods are on most of the soils on the steeper side slopes. Shortleaf pine and eastern redcedar are locally important. Many of the broader ridgetops are cleared and used principally for pasture. Erosion is the main hazard, and droughtiness is a limitation.

1. Goss-Weingarten-Hildebrecht association

Well drained and moderately well drained, moderately sloping to steep soils; on uplands

Areas of this association are on a dissected landscape that has long, narrow ridgetops and steep side slopes (fig. 4). The land commonly tilts gently toward the east. Local relief varies from 200 to 400 feet. All of the areas are drained by small streams. Many of the streams begin in these areas and have a fairly steep gradient. Slope ranges from 3 to 35 percent.

Areas of this association are extensive and make up about 35 percent of the county. They are about 55 percent Goss soils, 18 percent Weingarten soils, and 11 percent Hildebrecht soils. The rest is soils of minor extent.

Goss soils are moderately steep and steep and are well drained. They are on lower side slopes. They have a thin, dark brown cherty silt loam surface layer and a brown very cherty silt loam subsurface layer. The upper part of the subsoil is yellowish red very cherty silty clay loam; the middle part is dark red very cherty clay; and the lower part is dusky red cherty clay.

Weingarten soils are moderately sloping and strongly sloping and are well drained. They are on rather wide, rounded ridgetops. They have a surface layer of dark brown silt loam. The subsoil to a depth of about 35 inches is yellowish brown silt loam in the upper part, yellowish brown silty clay loam in the middle part, and dark yellowish brown silt loam in the lower part. Next is partially brittle brown silt loam. Below this, the subsoil is reddish brown cherty clay.

Hildebrecht soils are moderately sloping and strongly sloping and are moderately well drained. They mainly are on rounded, rather narrow ridgetops, but are on foot slopes in some areas. They have dark brown and brown surface and subsurface layers. The upper part of the subsoil is brown and strong brown, mottled silty clay loam; next is strong brown, brittle, extremely cherty silt loam; and the lower part is a brown, mottled, brittle, extremely cherty silty clay loam fragipan. Below this, the subsoil is dark red and strong brown very cherty clay.

Of minor extent in mapped areas are the dark, shallow Gasconade soils on the lower parts of side slopes; the silty Bloomsdale soils in narrow drainageways; and the cherty Wilderness soils on ridgetops and side slopes. Bloomsdale soils are nearly level and are subject to flash

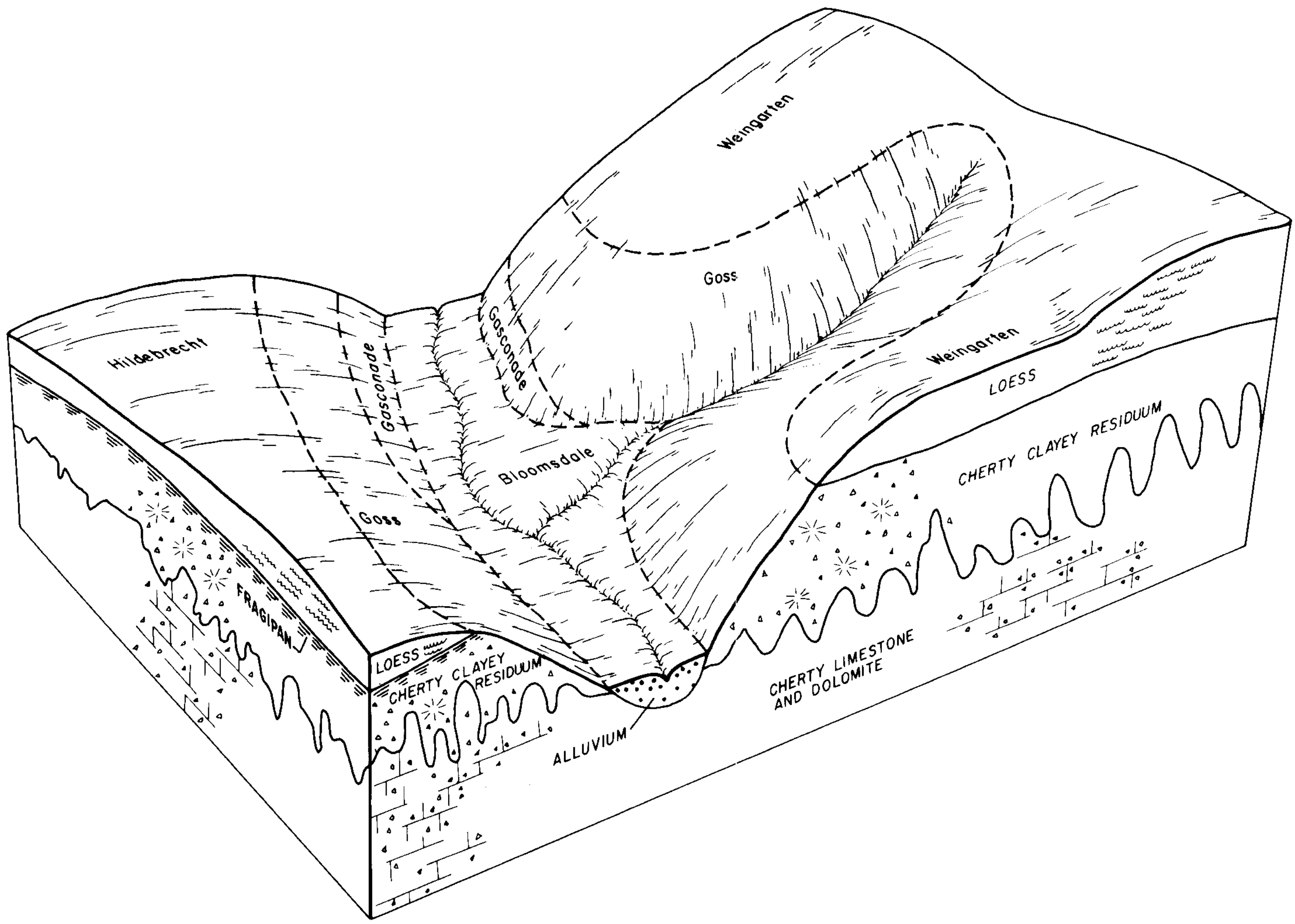

Figure 4.—Typical pattern of soils in the Goss-Weingarten-Hildebrecht association, dissected by a narrow bottom land, showing relationship of the soils to topography and parent materials.

flooding. Wilderness soils have a fragipan and are less clayey than the major soils.

About 60 percent of the areas of this association is in woodland. Most of the woodland is unimproved mixed hardwoods; some is shortleaf pine. Most ridgetops and stream bottoms are cleared and used for pasture. Some corn, grain sorghum, and wheat are grown in larger fields.

The soils on the ridgetops are suited to pasture, and this is the main use. The Hildebrecht soils are wet during spring and are droughty during summer. Slope is a limitation, and erosion is a hazard. Grazing when the soils are too wet and overgrazing are concerns of pasture management. Ponds and wells provide water for livestock. Many ponds have excess seepage because of the exposure of permeable cherty red clays in the reservoir.

The steep soils are suited to trees. Cutover timber and overgrazed woodlands are the main timber management concerns. The steep slopes are limitations, and erosion is a hazard along logging roads. Glade areas have shallow soils and support a sparse cover of eastern redcedar, scrub hardwoods, and native grasses.

Most areas of this association generally are not suitable for building site development because of the steep slopes. Ridgetops are commonly suited where adequate measures provide protection from wetness and shrink-swell. Sewage lagoons can be used for waste disposal where slopes are not too steep. There are serious limitations for septic tank absorption fields.

2. Goss-Menfro-Gasconade association

Well drained and somewhat excessively drained, moderately steep to very steep soils; on uplands

Areas of this association are on hills and long, narrow ridges (fig. 5). Local relief is about 400 feet. Streams are very small and gradients are steep. Slope ranges from 14 to 50 percent.

Areas of this association make up about 10 percent of the county. They are about 32 percent Goss soils, 28 percent Menfro soils, 20 percent Gasconade soils, and 20 percent soils of minor extent.

Goss soils are deep, moderately steep to very steep, and well drained. They are on side slopes. Where these soils are adjacent to Gasconade soils, they occupy the upper parts of the side slope. The surface layer is dark brown very cherty silt loam, and the subsurface layer is brown very cherty silt loam. The subsoil is brown very cherty silty clay loam in the upper part and red and dark red very cherty clay in the lower part.

Menfro soils are deep, moderately steep and steep, and well drained. They are on foot slopes, ridges, and side slopes where the loess is thick, mainly near the Mississippi River and on northeast-facing slopes. The surface layer is dark grayish brown, and the subsurface layer is yellowish brown silt loam. The subsoil is brown silt loam in the upper part and brown silty clay loam in the lower part. The substratum is brown silt loam.

Gasconade soils are shallow, moderately steep to very steep, and somewhat excessively drained. They are extensive on lower side slopes but in some areas are on upper side slopes and ends of ridges. The surface layer is very dark grayish brown, stony silty clay loam. The subsoil is dark brown, thin silty clay. Hard limestone is at a depth of 13 inches.

Of minor extent in mapped areas are the moderately deep Caneyville soils upslope from Gasconade soils, the silty Bloomsdale soils on narrow bottom lands, and the well drained Weingarten soils upslope from Goss soils. Weingarten soils have chert in the lower part of the subsoil. Menfro soils are chert free to a depth of 6 feet or more.

About 90 percent of the areas of this association is in native woodland. Mixed hardwoods are dominant, except for eastern redcedars in areas of shallow soils. Small areas on ridgetops and in creek bottoms have been cleared and are used for pasture. The areas are sparsely populated and have few access roads.

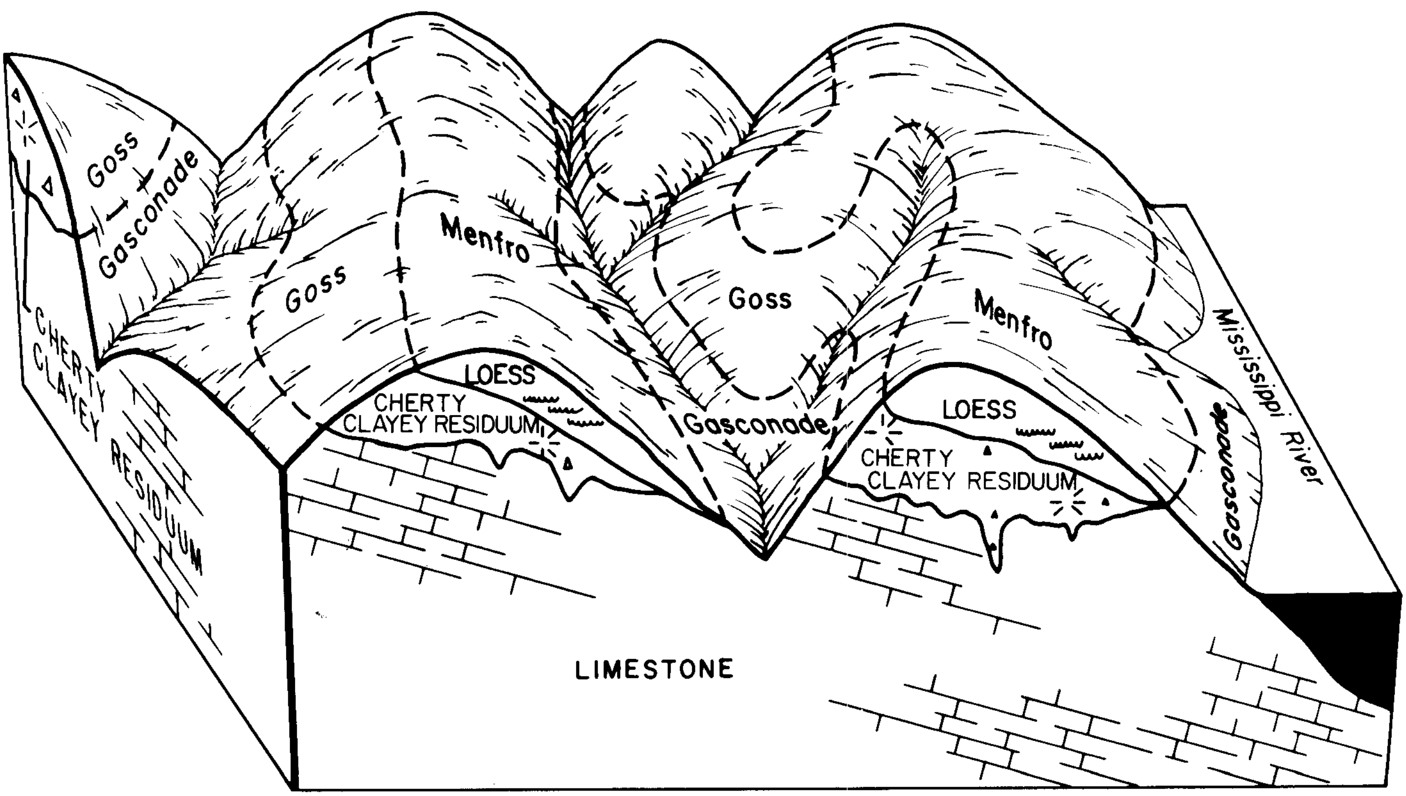

Figure 5.—Typical pattern of soils in the Goss-Menfro-Gasconade association in the River Hills, showing relationship of the soils to parent materials and topography.

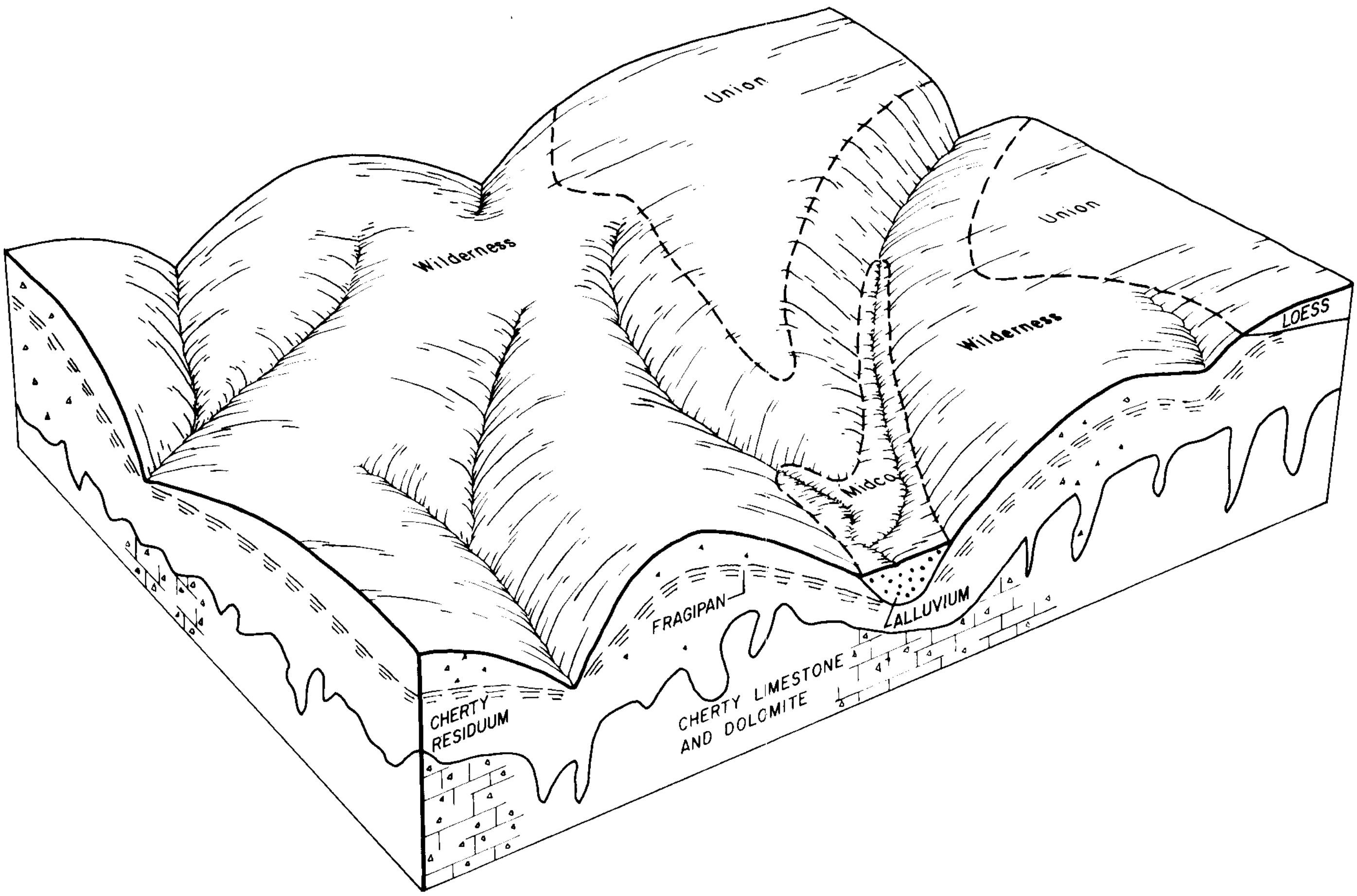

Figure 6.—Typical pattern of soils in the Wilderness-Union association, showing relationship of the soils to topography and parent materials.

The soils in this association are suited to trees. Management concerns are steep slopes, erosion hazards on logging roads and skid trails, and seedling mortality. Diversity of habitat is needed for upland game

The soils generally are not suitable for building site development because of steep slopes.

3. Wilderness-Union association

Moderately well drained, gently sloping to steep soils; on uplands

Areas of this association are on low hills and wide ridges near the headwaters of Coldwater and Saline Creeks (fig. 6). They generally have long, smooth south-facing slopes but break abruptly and steeply on north-facing slopes. Local relief is about 200 feet. Slope ranges from 3 to 30 percent.

Areas of this association make up about 3 percent of the county. They are about 69 percent Wilderness soils and 27 percent Union soils. The rest is soils of minor extent.

Wilderness soils are moderately steep and steep and are on side slopes and ends of ridges. They have a surface layer and subsurface layer of dark brown and brown cherty silt loam. The subsoil is strong brown cherty clay loam and yellowish red very cherty clay loam underlain by a mottled, brittle fragipan that is light yellowish brown very cherty loam, reddish yellow cherty silt loam, and strong brown cherty clay loam.

Union soils are gently sloping to moderately sloping and are on ridges and divides. They have a surface layer and subsurface layer of dark brown and brown silt loam. The upper part of the subsoil is strong brown and brown, mottled silty clay loam underlain by a mottled, brown and yellowish red, brittle, extremely cherty clay loam fragipan. Below this, the subsoil is dark red and yellowish red, very firm cherty clay.

Of minor extent in mapped areas are the poorly drained Auxvasse soils on foot slopes and terraces and the somewhat excessively drained Midco soils on narrow stream bottoms.

Nearly 30 percent of the areas of this association have been cleared. Most of the cleared areas are on broad smooth divides and are used for pasture. The uncleared areas are generally steep and moderately steep and are in woodland of mixed hardwoods and shortleaf pine.

The soils are suited to pasture and trees. Management concerns are erosion, equipment limitation because of steep slopes and chert, and seedling mortality. Where these soils are used for pasture, they are wet during spring and droughty during summer. Grazing when these soils are too wet and overgrazing are concerns of pasture management. Ponds are used for watering livestock.

Union soils are suitable for building site development and onsite waste disposal systems. Wetness and shrink-swell potential are the main limitations. Sewage lagoons can be used for onsite waste disposal in some areas. The soils in this association, with the exception of Union soils, generally are not suitable for septic tank absorption fields because of wetness and slow permeability of the underlying fragipan. Wilderness soils generally are not suitable for building sites because of steep slopes.

Dominantly Deep and Moderately Deep Soils Formed in Thin Loess and Residuum or Other Silty or Clayey Material

These soils formed in thin loess and the underlying clayey material. The underlying bedrock consists mainly of dolomite. These soils are on smooth rolling hills in the western part of the county. They make up about 10 percent of the county.

Most of these soils are cleared and are used for general farming. The areas are typically in pastureland, scattered woodlots, and interspersed fields of row crops, small grains, and hayland. Erosion is the main concern of management.

4. Fourche-Caneyville-Crider association

Moderately well drained and well drained, gently sloping to moderately steep soils; on uplands

Areas of this association are on broad, low divides and ridges and smooth side slopes (fig. 7). Local relief varies from 100 to 200 feet. The areas are drained by small streams, most of which begin within the areas. Slope ranges from 2 to 20 percent.

Areas of this association make up about 10 percent of the county. They are about 30 percent Fourche soils, 27 percent Caneyville soils, and 11 percent Crider soils. The rest is soils of minor extent.

Fourche soils are deep, gently sloping and moderately sloping, and moderately well drained. They are on side slopes and ridgetops. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam in the upper part, a reddish brown silty clay loam transitional layer in the middle part, and reddish brown, mottled silty clay in the lower part.

Caneyville soils are moderately deep, moderately sloping to moderately steep, and well drained. They are commonly on side slopes but are on ridgetops in some areas. They have a surface layer of dark brown silt loam. The subsoil is brown silt loam and reddish brown silty clay loam in the upper part, brown silty clay in the middle part, and dark yellowish brown, mottled, very firm clay in the lower part. Hard dolomite bedrock is at a depth of about 31 inches.

Crider soils are deep, moderately sloping to strongly sloping, and well drained. They are commonly on ridgetops. They have a surface layer of dark brown silt loam. The subsoil is brown silt loam and silty clay loam in the upper part and red silty clay loam and red silty clay in the lower part.

Of minor extent in mapped areas are the dark, shallow Gasconade soils on side slopes, the somewhat poorly drained Gerald soils on gentle divides, the moderately well drained Nicholson soils on ridgetops, and the silty Haymond soils in narrow drainageways. The Nicholson soils have a fragipan.

Most of the areas in this association have been cleared. About 50 percent of the acreage is used for pasture, and about 30 percent is used for cropland. The more sloping, shallow and stony soils remain in woodland of mixed hardwoods.

The deep, gently sloping soils are suited to cultivated crops. Alfalfa, corn, soybeans, and wheat are commonly grown. The moderately deep soils are droughty and are better suited to pasture and hay. Slope and the hazard of erosion are the major management concerns for crops and pasture. Erosion control measures in cultivated cropland consist of crop rotations, minimum tillage systems, crop residue management, and terraces. Moderate amounts of fertilizer are needed to maintain fertility. Most woodland consists of eastern redcedar and mixed hardwoods. Woodland is generally in the steeper areas that are not suited to pasture or cropland. Erosion and equipment limitations are the main woodland management concerns.

Areas of this association are suitable for building site development. Bedrock is too close to the surface in many areas for the construction of basements and septic tank absorption fields. Moderate shrink-swell potential, moderately slow permeability, and a seasonal high water table on Fourche soils are major concerns. In some areas, larger than standard septic tank absorption fields are needed or sewage lagoons are suitable.

Deep to Shallow Soils Formed in Loamy Residuum or Thin Loess and Loamy Residuum

These soils formed in thin loess and residuum that weathered from the underlying sandstone. They are on a broad plain in the western part of the county, part of which is dissected by small streams that are deeply entrenched. These soils make up about 17 percent of the county. The soil associations in this group differ in land use and topography.

Less than half the acreage of these soils is cleared. The forested areas consist of mixed hardwoods and shortleaf pine. Cleared areas are mostly on the broad divides and ridgetops. Erosion is the major hazard and concern of management.

5. Jonca-Lily association

Moderately well drained and well drained, moderately sloping and strongly sloping soils; on uplands

Areas of this association are on a broad divide that separates the east- and west-flowing streams. They drain mostly toward the west. Local relief is about 150 feet. Most of the small streams begin within areas of this association and are deeply entrenched (fig. 8). Slope ranges from 3 to 14 percent.

Areas of this association make up about 9 percent of the county. They are about 50 percent Jonca soils and 38 percent Lily soils. The rest is soils of minor extent.

Jonca soils are deep, moderately sloping, and moderately well drained. They are on broad gentle divides. They have a surface layer of dark brown and brown silt loam. The upper part of the subsoil is strong brown silty clay loam and clay loam. Next is a mottled, dense, brittle, yellowish brown fragipan. Below this, the subsoil is yellowish red, hard and brittle clay loam.

Lily soils are moderately deep, strongly sloping, and well drained. They are on side slopes. They have a

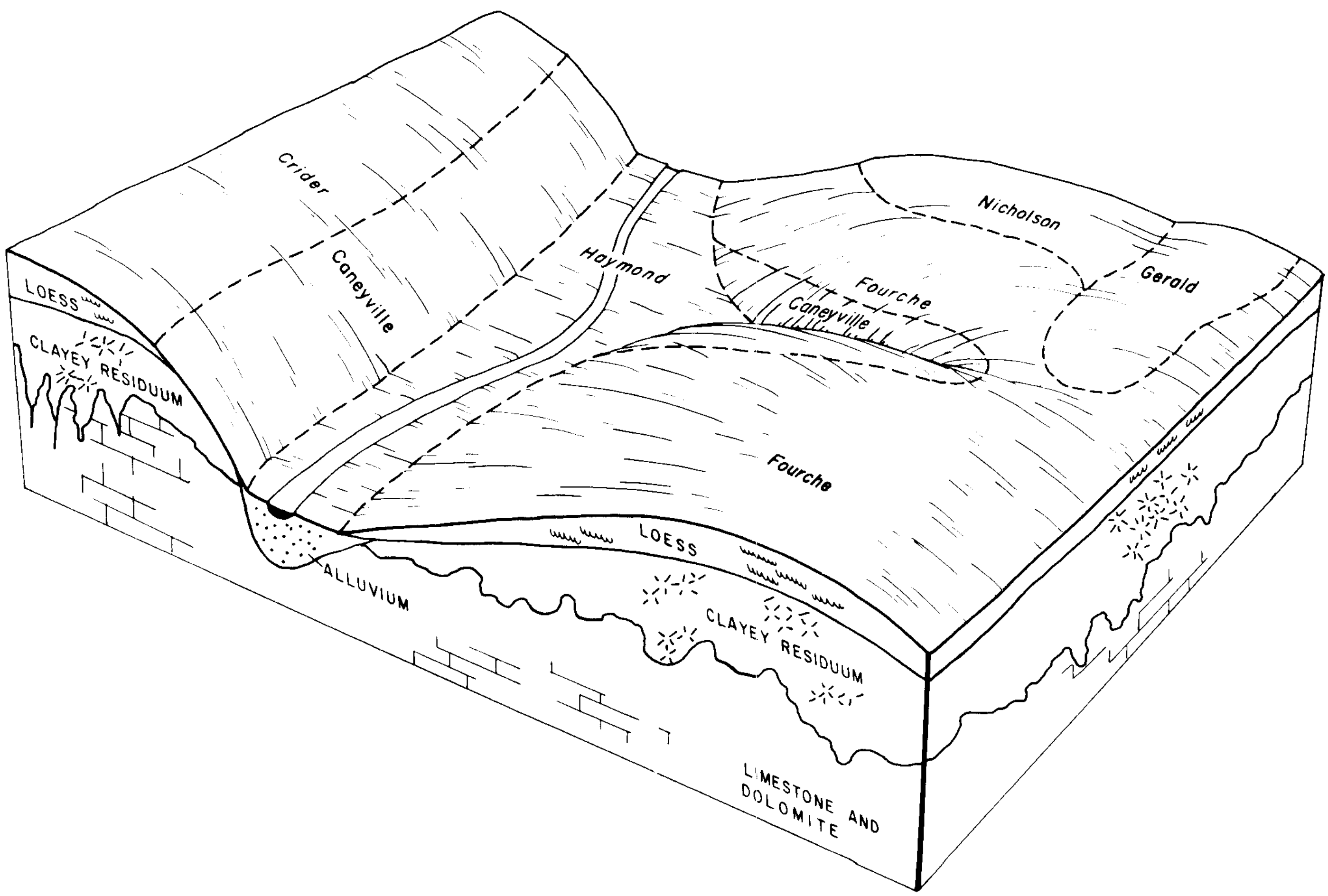

Figure 7.—Typical pattern of soils in the Fourche-Caneyville-Crider association, showing relationship of the soils to topography and parent materials.

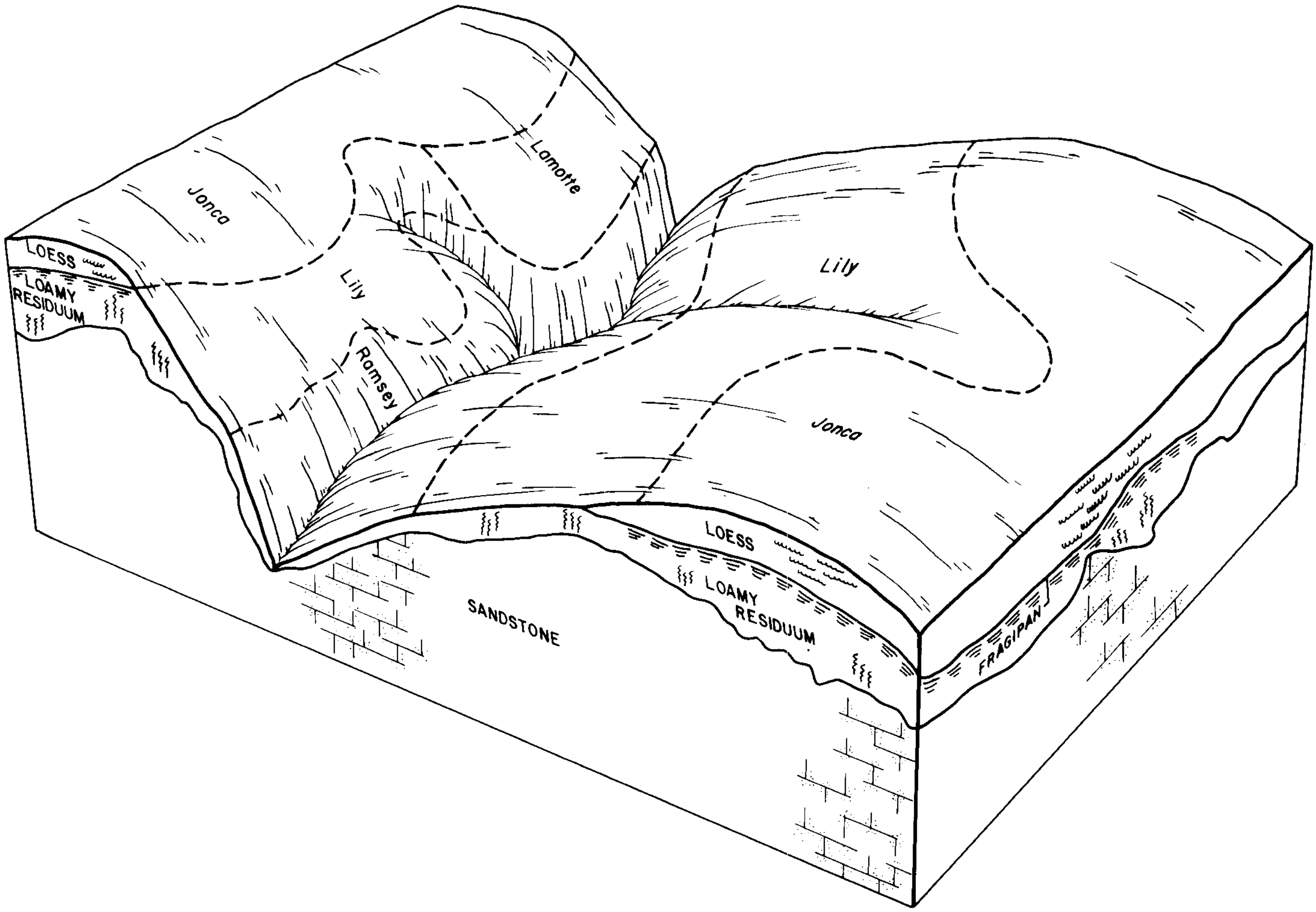

Figure 8.—Typical pattern of the soils in the Jonca-Lily association, showing relationship of the soils to topography and parent materials.

surface layer of dark brown loam and a subsurface layer of yellowish brown loam. The subsoil is brown loam in the upper part and strong brown clay loam in the lower part. Hard sandstone is at a depth of about 31 inches.

Of minor extent in mapped areas are the shallow Ramsey soils on the lower part of side slopes and the deep, well drained Lamotte soils on side slopes and ridgetops. Lamotte soils do not have a fragipan.

About 70 percent of the areas of this association have been cleared. Most of the cleared areas are on the gentle smooth divide and are used for pasture and hay. Only a small acreage is cropped to corn. The uncleared acreage is mostly steep areas bordering streams.

The soils are suited to pasture and woodland. The soils are wet in spring and are droughty during summer. Grazing when the soils are too wet and overgrazing are concerns of pasture management. The hazard of erosion is the main limitation where cultivated crops are grown. Wooded areas consist of mixed hardwoods and shortleaf pine.

Areas of this association are suitable for building site development. Wetness, depth to rock, and slow permeability are the major concerns. In some areas, sewage lagoons are satisfactory for waste disposal. Septic tank absorption fields generally are not suited because of the slow permeability and depth to rock.

6. Lily-Ramsey association

Well drained and somewhat excessively drained, strongly sloping to steep soils; on uplands

Areas of this association are on the dissected part of the rolling Farmington Plain. Landforms such as steep backslopes, knolls, and canyons have resulted because headward erosion, parallel retreat of slopes, and stream entrenchment have wasted away the original plain (fig. 9). Slope ranges from 9 to 35 percent.

Areas of this association make up about 8 percent of the county. They are about 40 percent Lily soils, 36

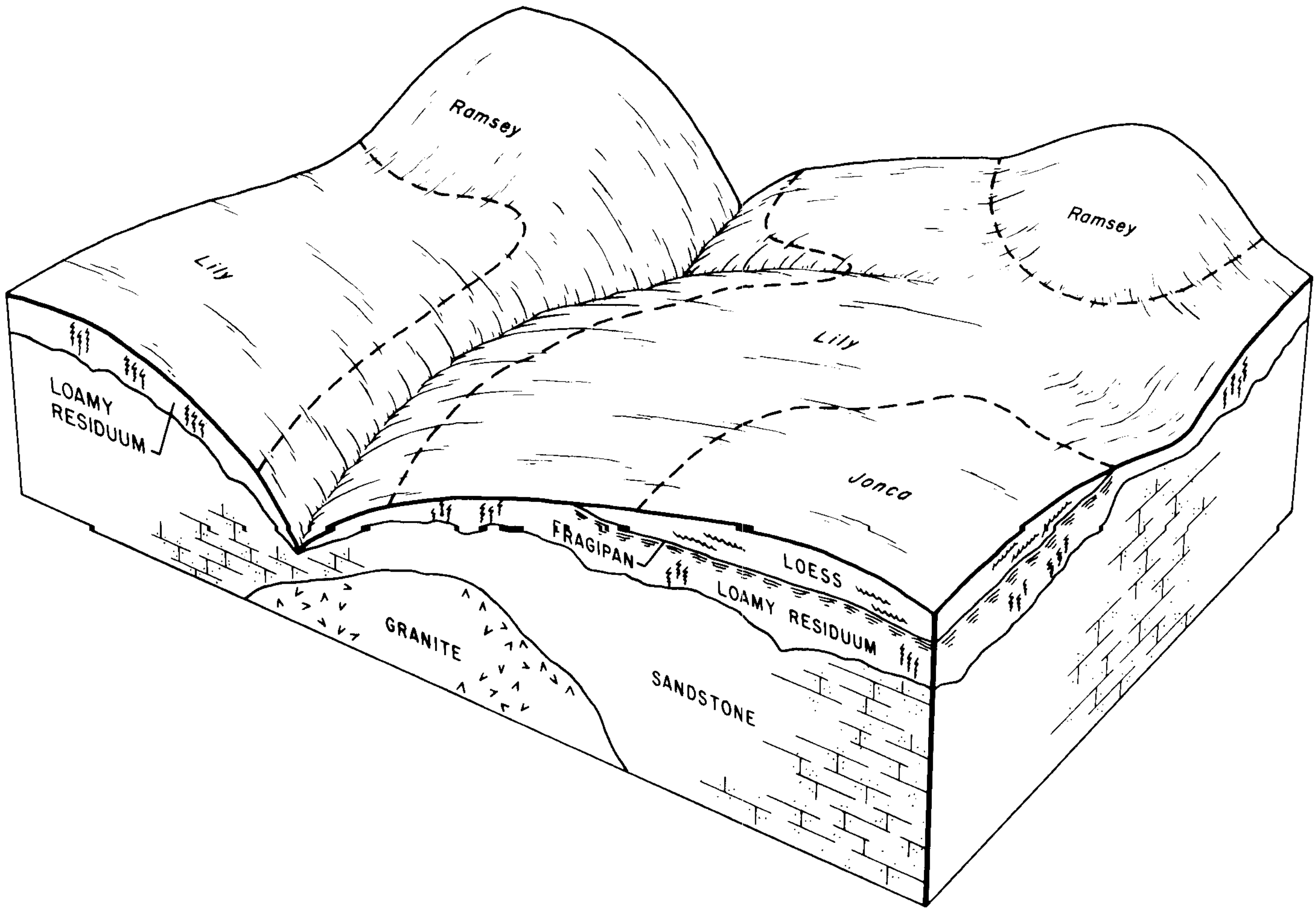

Figure 9.—Typical pattern of soils in the Lily-Ramsey association, showing relationship of the soils to topography and parent materials.

percent Ramsey soils, and 24 percent soils of minor extent.

Lily soils are moderately deep, strongly sloping, and well drained. They are on side slopes and interflues. They have a surface layer of dark brown loam and a subsurface layer of yellowish brown loam. The subsoil is brown loam in the upper part and strong brown clay loam in the lower part. Hard sandstone is at a depth of about 31 inches.

Ramsey soils are shallow, moderately steep to steep, and somewhat excessively drained. They are on side slopes and canyons and on knolls that have outcrops of rock. They have a surface layer of very dark grayish brown stony loam and a subsurface layer of brown loam. The subsoil is yellowish brown loam. Hard sandstone is at a depth of about 15 inches.

Of minor extent in mapped areas are the moderately well drained Jonca soils on ridgetops and the moderately deep Syenite soils on low valley slopes. Jonca soils have a fragipan. Syenite soils have less sand than Lily soils and are underlain by granite.

About 85 percent of the areas of this association is forested. Forested areas commonly are rough and steep, but some are moderately sloping on ridges and in narrow bottom lands. Major species are mixed hardwoods and shortleaf pine. Most cleared areas are on the more gentle ridgetops and bottom lands. Cleared areas are mainly used as pastureland and hayland, but a few of these areas have been abandoned.

The soils in this association are suited to trees. The erosion hazard, equipment limitations, seedling mortality, and windthrow are major concerns on Ramsey soils.

These soils are suited to recreation, and many areas have unusual natural beauty. Hawn State Park, Orchid Valley, Hickory Canyon Natural Area, and River Bluff Girl Scout Camp are mainly in areas of this association. Notable sandstone features are the Chimney Rocks and

the natural bridges. Also, many bluffs, waterfalls, and rock features are present.

Some moderately sloping areas of Lily soils are suitable for building site development. Sewage lagoons are suitable for waste disposal in some areas. Depth to rock is a major concern.

Dominantly Deep Soils Formed in Loess or Loess and Loamy Residuum

These soils formed in thick loess or in loess and loamy residuum. They are on rolling karst areas and on ridgetops and side slopes. The underlying bedrock is limestone, dolomite, or sandstone. Geological processes of the past led to development of karst features in certain areas of Ste. Genevieve County. The areas that have extensive karst features are separated from other areas of thick loess deposits because of the unique features associated with this landscape.

More than 80 percent of these soils are cleared and used for general farming. Forests are mixed hardwoods. More than half of the cleared acreage is used for cultivated crops. The steeper areas are used for the production of pasture and hay. Alfalfa, orchards, and truck crops are locally important.

7. Menfro association

Well drained, undulating to steep soils; on karst uplands

Areas of this association are on the rolling Karst Plains, along a few streams, and on some steep slopes. The Karst Plains are made up of complex slopes, many sinkholes, and sinkhole ponds (fig. 10). Most runoff collects in narrow, short drainageways that enter underground drainage systems. Slope ranges from 2 to 35 percent.

Areas of this association make up about 8 percent of the county. They are about 90 percent Menfro soils and 10 percent soils of minor extent.

Menfro soils are on all positions of the landscape. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam, and the substratum is brown silt loam.

Of minor extent in mapped areas are Gasconade soils on the lower parts of side slopes. The Gasconade soils are shallow and steep and have a dark surface layer. Mine dumps are in areas near Ste. Genevieve. They consist of finely pulverized residue from the manufacture of limestone products.

About 90 percent of the areas of this association has been cleared. General farming is a main enterprise. Corn, wheat, and forages are the major crops. Soybeans, grain sorghum, and specialty crops from small orchards and gardens are also important. The woodlands are in small, steep areas in drainageways and sinkholes.

The soils are suited to cultivated crops and pasture. Slope is a limitation, and erosion is a hazard. Crop rotation, residue management, and terraces help to control erosion in cultivated cropland. Crop residue management and minimum tillage systems can be used where slopes are too irregular or steep for efficient use of terraces. Much of the grain crops grown are fed locally to cattle and hogs. Well managed pasture helps to keep erosion to a minimum. Alfalfa, clovers, and grasses grow well. Moderate amounts of fertilizer and lime are needed to maintain fertility.

Many areas of this association are suitable for building site development. Some areas generally are not suited because of certain karst features. The moderate shrink-swell potential and the slope are limitations. Septic tank absorption fields function well in most areas. A rural water system provides water in many areas. Shallow wells commonly are not dependable and can become contaminated because of the karst features.

8. Minnith-Menfro association

Moderately well drained and well drained, moderately sloping and strongly sloping soils; on uplands

Areas of this association are in a long valley that lies between higher cherty hills. The soils in the valley are on ridges and side slopes that were formed by small streams that cross the valley (fig. 11). The soils are deep except on some steep areas where sandstone, dolomite, or limestone is near the surface. Slope ranges from 3 to 14 percent.

Areas of this association make up about 8 percent of the county. They are about 40 percent Minnith soils, 34 percent Menfro soils and soils that are similar to Menfro soils, and 26 percent soils of minor extent.

Minnith soils are moderately sloping and strongly sloping and are moderately well drained. They are on ridgetops and side slopes but are mainly on the lower parts of side slopes. They have a surface layer of dark brown silt loam and a subsurface layer of brown silt loam. The subsoil is yellowish brown silt loam and dark yellowish brown silty clay loam in the upper part and dark yellowish brown, mottled clay loam and yellowish brown, mottled loam in the lower part. The substratum is strong brown, mottled loam. Hard sandstone is at a depth of 85 inches.

Menfro soils are moderately sloping and strongly sloping and are well drained. They are on ridgetops, side slopes, and foot slopes commonly on the east side of the valley. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam, and the substratum is yellowish brown silt loam.

Of minor extent in mapped areas are the shallow, steep, dark Gasconade soils on side slopes; the shallow, steep, light colored Ramsey soils on side slopes; and the Ross soils on flood plains.

About 75 percent of the areas of this association have been cleared. Nearly half of the cleared areas are used for cultivated crops. Corn, grain sorghum, soybeans, and

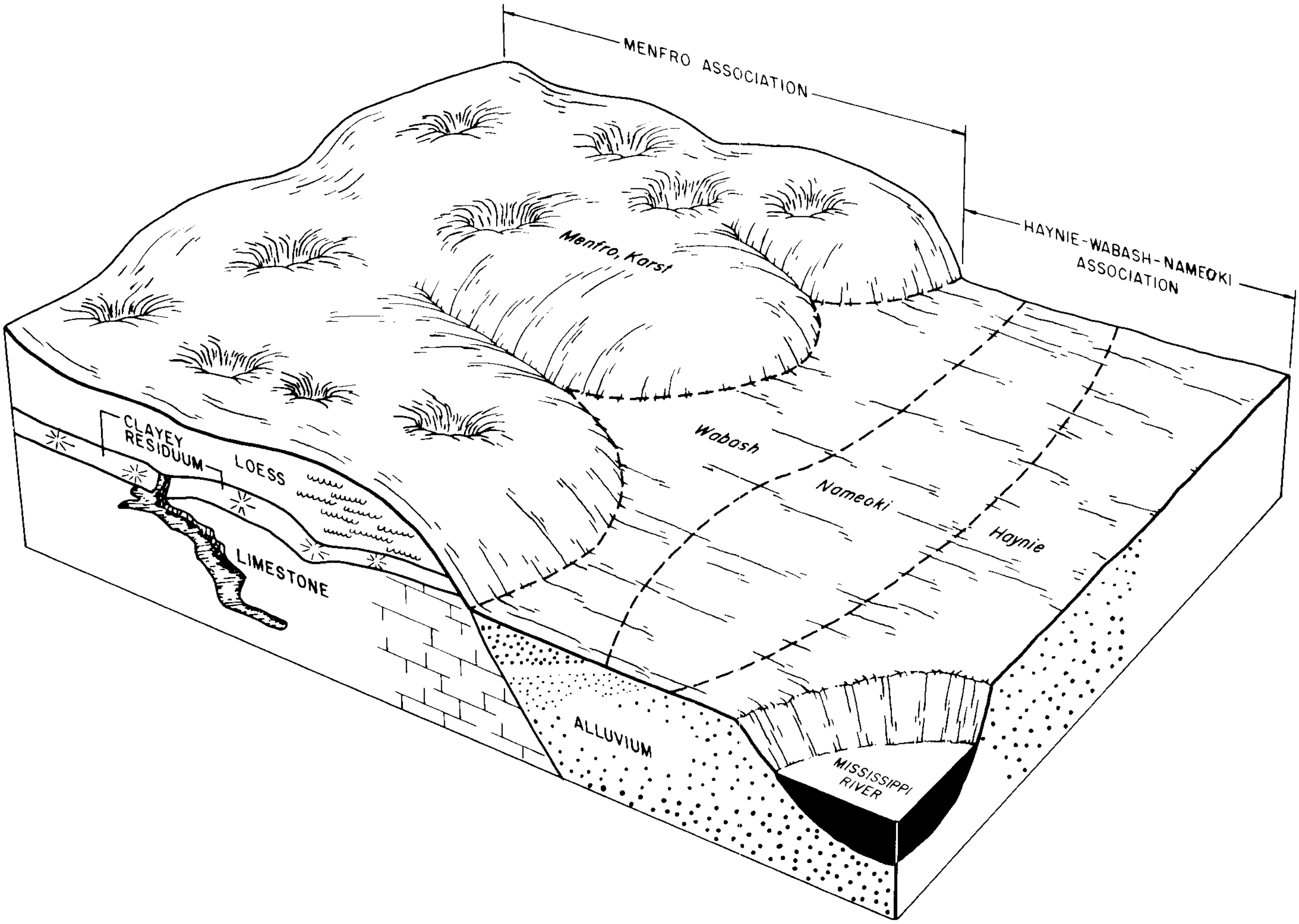

Figure 10.—Typical pattern of the soils in the Menfro and the Haynie-Wabash-Nameoki associations, showing relationship of the soils to topography and parent materials.

wheat are grown on the less sloping areas, and forage crops are grown on the steeper areas. The forested areas, commonly on the minor soils, consist of mixed hardwoods.

The soils are suited to cultivated crops and pasture. Slope is a limitation, and erosion is a hazard. Crop rotation, crop residue management, and terraces help to control erosion in cultivated cropland. Residue management and minimum tillage systems can be used where slopes are too irregular for efficient use of terraces. Much of the grain crops grown are fed locally to cattle and hogs. Well managed pasture helps to keep erosion to a minimum. Alfalfa, clovers, and grasses grow well. Moderate amounts of fertilizer are needed to maintain fertility.

Areas of this association are suitable for building site development. Moderate shrink-swell potential and slope are the main concerns for dwellings. Septic tank absorption fields generally function well on Menfro soils, but moderately slow permeability is a severe limitation on Minnith soils.

Dominantly Deep Soils Formed in Alluvium, Subject to Flooding

These soils formed dominantly in clayey, silty, or loamy alluvium. They are on the flood plains of the Mississippi River and its tributaries. Soil texture and drainage vary widely. These soils make up about 9 percent of the county.

Most areas of these soils have been cleared and are used for cultivated crops. Corn, soybeans, and wheat are grown continuously. Much of the wheat acreage is double cropped with soybeans. Management concerns

are protection from flooding, providing surface drainage, and keeping the soil in good physical condition.

9. Haymond-Ross-Ashton association

Well drained, nearly level soils; on flood plains and terraces

Areas of this association are on flood plains and low terraces along tributaries of the Mississippi River and other small streams. Commonly, a steep escarpment is on the stream side of the terraces. Areas are long and narrow. They generally are less than one-half mile wide and dissect other associations. Slope ranges from 0 to 3 percent.

Areas of this association make up about 5 percent of the county. They are about 30 percent Haymond soils, 14 percent Ross soils, and 13 percent Ashton soils. The rest is soils of minor extent.

Haymond soils are on flood plains where a major part of the parent material was washed from loess-covered uplands. They have a surface layer of dark brown silt loam. Below this is yellowish brown, dark brown, and brown silt loam.

Ross soils are on the upper reaches of the flood plains where the parent materials were washed from a mixture of sources and vegetation was both forest and prairie. They have a surface layer of dark brown silt loam and a subsoil of very dark grayish brown silt loam. The substratum is dark brown and dark grayish brown silt loam.

Ashton soils are on low stream terraces commonly above the normal level of flooding. They have a surface layer of dark brown and brown silt loam. The subsoil and substratum are brown silt loam.

Of minor extent in mapped areas are the poorly drained Auxvasse soils and the somewhat poorly drained

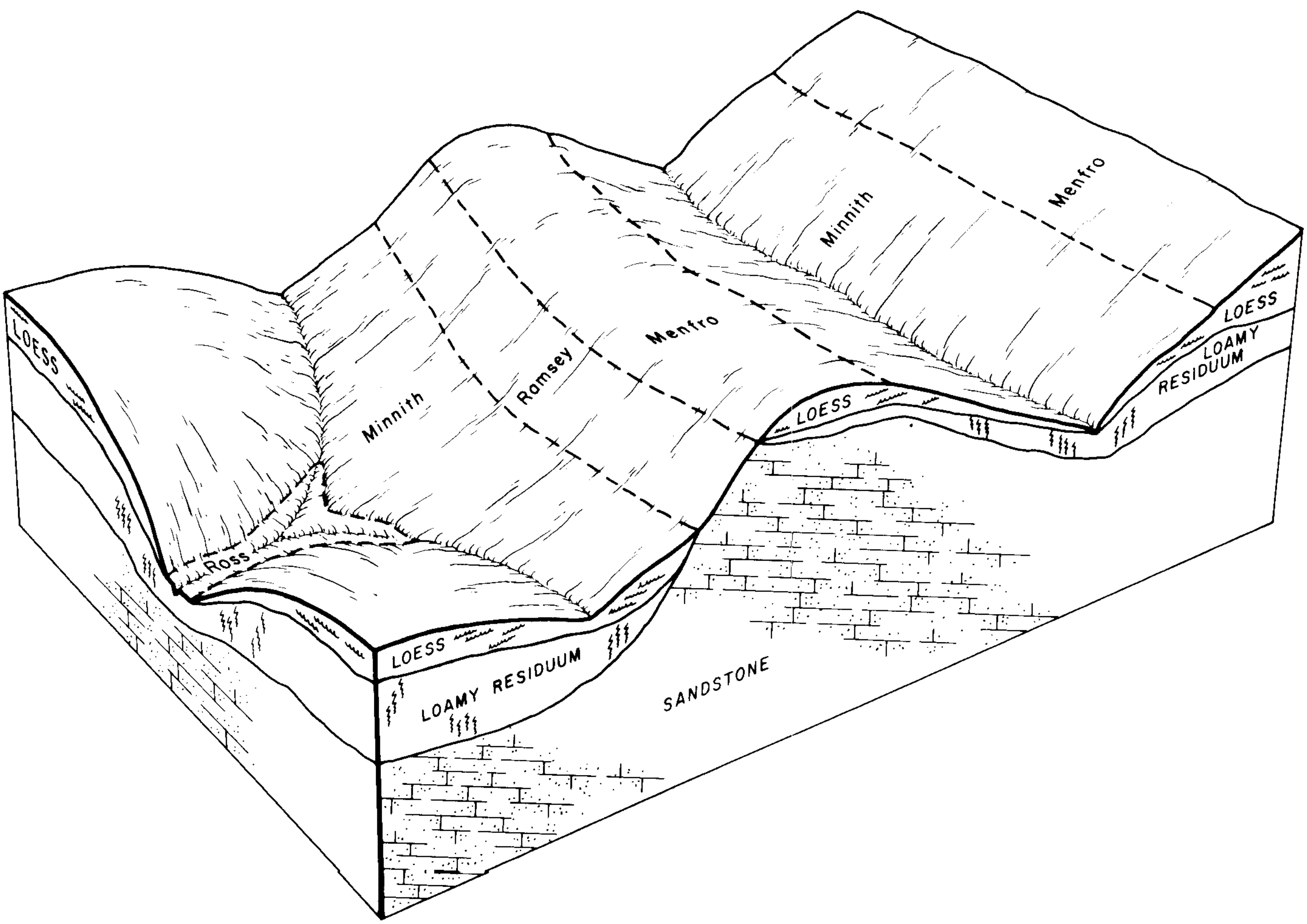

Figure 11.—Typical pattern of soils in the Minnith-Menfro association, showing relationship of the soils to parent materials and topography.

Freeburg soils on stream terraces. The moderately well drained Wilbur soils are on the lower reaches of flood plains.

Nearly all areas of this association are cleared and are used as cultivated cropland. Corn, soybeans, wheat, and alfalfa are the major crops. Pasture and hay are grown on some of the sloping soils on terraces. Some trees, mainly cottonwood and sycamore, remain near the stream channel. Flooding is frequent early in spring. The soils require only light to moderate amounts of fertilizer to maintain soil fertility.

The soils are suitable for cultivated crops, forages, and trees. Flooding can be a hazard to small grains, the planting of summer annuals, and to grazing. It can be a hazard to hay crops during spring.

Areas of this association generally are not suitable for building site development because of flooding.

10. Haynie-Wabash-Nameoki association

Moderately well drained to very poorly drained, nearly level soils; on flood plains

Areas of this association consist of deep alluvial soils on the Mississippi River flood plain (see fig. 10). Commonly, the coarse textured soils are near the river channel and the fine textured soils are in low swales farthest from the channel. Some areas are nearly ponded or have very slow runoff. Slope ranges from 0 to 2 percent.

Areas of this association make up about 4 percent of the county. They are about 25 percent Haynie soils, 23 percent Wabash soils, and 20 percent Nameoki soils. The rest is soils of minor extent.

Haynie soils are moderately well drained and generally are on natural levees bordering the river channel. They have a surface layer of very dark grayish brown silt loam. Below this is stratified grayish brown and dark grayish brown silt loam and brown and grayish brown very fine sandy loam.

Wabash soils are very poorly drained and are mostly in swales farthest from the river, in some places bordering the uplands. They have a surface layer of very dark grayish brown silty clay. The subsoil is very dark gray and dark gray, mottled silty clay.

Nameoki soils are somewhat poorly drained and commonly are between areas of Haynie and Wabash soils. They have a surface layer and subsurface layer of very dark gray silty clay. The subsoil is dark gray and dark grayish brown silty clay grading to dark grayish brown clay loam. The substratum is grayish brown silt and grayish brown sand.

Of minor extent in mapped areas are the poorly drained, less clayey Beaucoup soils between areas of Wabash and Haynie soils; the well drained, more sandy Carr soils near the stream channels; and the moderately well drained, lighter colored Wilbur soils near small drainageways.

Nearly all areas of this association are cleared and used for cultivated crops. Flooding is a hazard, although levees protect much of the farmland. Soil management concerns are providing surface drainage and keeping the soil in good tilth. Applications of nitrogen fertilizer benefit nonlegume crops; otherwise, the soils generally have an adequate supply of nutrients. The potential is good for irrigated crops.

The soils are suited to corn, soybeans, grain sorghum, small grains, alfalfa, clovers, grasses, and trees. Corn, small grains, and alfalfa are better suited to the higher sites with good drainage, and soybeans are somewhat better suited to the clayey soils.

Areas of this association generally are not suitable for building site development because of flooding.

Detailed Soil Map Units

The map units on the detailed soil maps represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Menfro silt loam, 3 to 9 percent slopes, is one of several phases in the Menfro series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Goss-Menfro complex, 14 to 45 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps, mine, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

1C—Lamotte silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is on side slopes and ridgetops. Areas commonly are oblong and range from 10 to 50 acres.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil to a depth of 52 inches is yellowish red and dark red clay loam. The substratum to a depth of 64 inches or more is dark red, firm clay loam. In some areas, the depth to weathered sandstone is less than 40 inches.

Included with this soil in mapping are small areas of Jonca and Lily soils. The Jonca soils have a fragipan and are on the higher positions. The Lily soils are less than 40 inches in depth to hard sandstone and are on positions similar to those of this Lamotte soil. The included soils make up about 12 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is medium, and available water capacity is high. Reaction ranges from medium acid to neutral in the surface layer and from medium acid to extremely acid in the subsoil. The surface layer is friable and is easily tilled. The natural fertility and the organic matter content are low. Rooting conditions are favorable throughout the solum. The shrink-swell potential is moderate.

A few areas of this soil are used for cropland. Corn, soybeans, and wheat are suited. Major soil management concerns are keeping erosion to a minimum and maintaining tilth. This soil is easily eroded if it is used for cultivated crops. In most areas, terraces, no-tillage systems, and cropping systems that include small grains, grass-legume meadows, or both of these help to keep the soil losses low. No-tillage systems are effective where terraces are not used. They help to increase the

number of years grain crops can be kept in a rotation. Plowpans or traffic pans form readily in cultivated fields. Reducing tillage operations, subsoiling or chiseling, and maintaining the organic matter content help to keep this soil in good tilth. Soil amendments are needed to produce high yields.

Most areas of this soil are used for pasture. Grasses and legumes, including alfalfa, are suited. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help keep the pasture in good condition. Pond reservoirs in some areas need sealing or compacting to prevent excess seepage.

This soil is suited to trees for wood crops or for orchards. Some areas remain in native hardwoods. Woodlots need protection from grazing and trampling by livestock. This soil does not have major management concerns in the planting or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems where proper design and installation procedures are used. Septic tank absorption fields need to be enlarged to work favorably in some areas. The bottoms of sewage lagoons require sealing with slowly permeable material to prevent excess seepage. In some areas, leveling is necessary to modify slope. The shrink-swell potential can be overcome by adequate reinforcement steel in concrete footings, foundations, and basement walls and by backfilling with sand or gravel.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

1D—Lamotte silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on upland side slopes. Areas are oblong and range from 10 to 50 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish red and dark red clay loam about 30 inches thick, and the lower part to a depth of about 60 inches is dark red sandy clay loam. In some areas, weathered sandstone is at a depth of less than 36 inches. In about half of the cleared fields, the plowed layer is mixed, dark brown silt loam and yellowish red clay loam.

Included with this soil in mapping are areas up to about 5 acres of Lily soils. These soils are moderately deep to bedrock. They are on positions similar to those of this Lamotte soil and make up about 8 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is medium, and available water capacity is high. The surface layer is medium acid to neutral. It is friable and is easily tilled. The subsoil is strongly acid to extremely acid. The natural fertility and the organic matter content are low. Conditions are commonly favorable for root growth to a depth of 60 inches. The shrink-swell potential is moderate.

This soil is suited to cultivated crops. Effective erosion control and keeping the soil in good tilth are major soil management concerns. Terraces and cropping systems that include small grains, grass-legume meadows, or both of these help to control erosion. No-tillage systems help to increase the number of years grain crops can be grown in a rotation. Reducing tillage operations, subsoiling or chiseling, and maintaining the organic matter content in the surface layer help keep this soil in good tilth. Soil amendments are needed to produce high yields.

Most areas of this soil are used for forage crops. Grasses and legumes are suited. Pasture in good condition effectively helps to control erosion. Protection from overgrazing and maintaining fertility help keep the pasture in good condition.

This soil is suited to trees, and some areas are in native hardwoods. This soil does not have major management concerns in the planting or harvesting of trees. Woodlands should be protected from grazing and wildfire.

This soil is suitable for building site development and for onsite waste disposal systems. Shrink-swell potential is a hazard for dwellings, but it can be overcome by adequate reinforcement steel in concrete footings, foundations, and basement walls. Slope is a limitation to dwellings and sewage lagoons. The slope limitation can be reduced by landshaping and leveling of sites. Where this soil is used for pond reservoir areas or sewage lagoons, excessive seepage is a common concern. Sealing the bottom of lagoons with slowly permeable material helps to prevent excess seepage. A dispersant type of sealant, compaction, or blanketing with a slowly permeable material can be used to seal the pond reservoir area.

This soil is in land capability classification IVe. The woodland ordination symbol is 3o.

2C—Caneyville silt loam, 3 to 9 percent slopes. This moderately deep, moderately sloping, well drained soil is on side slopes and ridgetops. Areas generally are oblong and in an irregular pattern along the ridgetops and divides. Areas range from 50 to 300 acres.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is about 21 inches thick. The upper part of the subsoil is brown, friable silt loam and reddish brown, firm silty clay loam; the middle part is brown, very firm silty clay; and the lower part is dark yellowish brown, mottled, very firm clay. Below the subsoil is gray, hard dolomite. In some areas, the original surface layer has been removed by erosion and the present surface layer is reddish brown silty clay loam.

Included with this soil in mapping are small areas of deep Crider soils commonly on ridgetops, areas of shallow stony Gasconade soils on the lower part of slopes, and small wet spots and seeps in which the

subsoil is grayish brown. The included soils make up about 15 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is low. Reaction ranges from medium acid to mildly alkaline throughout. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. Rooting is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate in the subsoil.

Most areas of this soil are used for forage crops, and a small acreage is used for cultivated crops. Irrigation is suitable in some areas. Wheat, grain sorghum, and corn are suited and are the more commonly grown crops. The main soil management concerns are the severe hazard of erosion and the limited available water capacity. Terraces are not favorable for erosion control in most places because of the depth to rock. Cropping systems that include small grains, grass-legume meadows, or both of these effectively help to control erosion. No-tillage systems help to increase the number of years grain crops can be grown in a rotation. Selection of drought-resistant crops and early plantings minimize the moisture stress that commonly occurs in this soil. Additional soil management concerns are keeping the soil in good tilth and maintaining soil fertility. Erosion control, residue management, and additions of organic matter help keep the soil in good tilth and help absorb most of the rainfall. Soil amendments are needed for high yields.

This soil is suited to grasses and legumes for pasture and hay crops. Pasture in good condition effectively helps to control erosion. Pasture management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, loss of stand, and excess runoff. Proper stocking rates, pasture rotation, deferred grazing, and adequate application of fertilizers help to keep the pasture and soil in good condition.

A few areas of this soil are in native hardwoods. Woodlands commonly are small and are poorly managed. The areas generally contain shallow soils or soils that have been eroded. Tree species are upland hardwoods and eastern redcedar. Seedling mortality and windthrow are management concerns. Planting special stock of a larger size than usual helps to achieve better survival. Lighter, less intensive, more frequent thinnings reduce stand density and windthrow damage. Woodlots need protection from grazing.

This soil generally is not suitable for dwellings with basements because of the depth to bedrock. It is suited to dwellings without basements. Footings and foundations should be designed with adequate steel reinforcement to withstand the shrinking and swelling of this soil. Septic tank absorption fields generally are not suited because of the moderately slow permeability and the depth to bedrock. Depth to bedrock is a limitation to sewage lagoons. Other disposal systems, such as a mound system for absorption fields, can be used, or sewage can be piped to adjacent areas that are more suitable. Detailed investigation is needed to determine the design and feasibility of onsite waste disposal.

This soil is in land capability classification IIIe. The woodland ordination symbol is 4c.

2D—Caneyville silt loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, well drained soil is on side slopes around small drainageways. Areas commonly are long and narrow and have irregular boundaries. They range from 20 to 200 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is strong brown, firm silty clay about 24 inches thick. Hard dolomite is below this. In some areas, a part or all of the original surface layer has been removed by erosion and the present surface layer is brown silty clay loam. The depth to bedrock is more than 40 inches in some areas.

Included with this soil in mapping are small areas of stony Gasconade soils on the steeper positions. Bedrock is at a depth of less than 20 inches in these areas. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is low. Reaction ranges from medium acid to neutral. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. Rooting is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate.

Most areas of this soil are used for forage crops. Some areas are in cultivated cropland. This soil generally is suited to cultivated crops. The main soil management concerns are the severe hazard of erosion and the low available water capacity. Using conservation tillage systems increases the number of years that grain crops can be grown in a rotation. Reducing tillage operations and maintaining organic matter content in the surface layer help keep the soil in good tilth and help reduce erosion.

This soil is suited to grasses and legumes. Grasses and legumes grown for pasture and hay effectively help to control erosion. Pasture management concerns are preventing overgrazing and maintaining adequate stands. Overgrazing causes compaction, loss of stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and adequate fertility help keep the pasture and soil in good condition.

Some areas of this soil remain in woodland. About 10 percent is small areas of mixed upland hardwoods and eastern redcedar. Seedling mortality and windthrow are management concerns. Planting special stock of a larger size than usual may be necessary to achieve better seedling survival. Lighter, less intensive, more frequent

thinnings help to reduce stand density and reduce windthrow damage. Woodlots need protection from grazing.

This soil is suitable for dwellings without basements. It is suited to some kinds of onsite waste disposal systems. Footings and foundations should be designed with adequate steel reinforcement to withstand the shrinking and swelling of the subsoil. Septic tank absorption fields generally are not suited because of the moderately slow permeability and the depth to bedrock. Depth to bedrock is a limitation for sewage lagoons. Extra soil material is needed in some areas to properly construct lagoons, and the site needs to be leveled to modify the slope. Other disposal methods, such as a mound system for absorption fields, can be used, or sewage can be piped to adjacent areas that are more suitable. A detailed investigation of the site is helpful to determine the kind of system, the design, and the feasibility of onsite waste disposal.

This soil is in land capability classification IVe. The woodland ordination symbol is 4c.

2E—Caneyville stony silt loam, 14 to 20 percent slopes. This moderately deep, moderately steep, well drained soil is on side slopes adjacent to V-shaped draws. Limestone rocks, 10 to 24 inches in diameter, cover as much as 10 percent of the surface. Areas are irregular in shape and commonly range from 20 to 150 acres.

Typically, the surface layer is dark grayish brown stony silt loam about 7 inches thick. The subsoil is yellowish red, firm silty clay loam and silty clay. Hard dolomite is at a depth of about 30 inches. In some areas, the bedrock is pinnacled and depth to rock varies from 1 foot to 4 feet, even within a short distance.

Included with this soil in mapping are small areas of deep Crider soils on the less sloping positions and shallow, stony Gasconade soils commonly above ledges along the lower part of slopes. The included soils make up about 10 to 15 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is low. Reaction ranges from medium acid to mildly alkaline. The surface layer contains stones but is friable. The natural fertility is medium, and the organic matter content is moderately low. Rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential in the subsoil is moderate.

Most areas remain in native woodland. This soil is suited to trees. Stones on the surface and slopes are equipment limitations. Other management concerns are seedling mortality, windthrow, and slow growth. Careful layout and management of roads and trails help reduce erosion and prevent gullying. Seeding disturbed areas may be necessary after harvesting is completed. Older trees of poor quality should be removed to provide growing room for young, more vigorous trees. Planting special stock of a larger size than usual or container-grown stock is necessary in some areas to achieve better survival. Lighter, less intensive, more frequent thinnings help to reduce stand density and reduce windthrow damage. Woodlots need protection from grazing.

Some areas of this soil are used for pasture. This soil is suited to grasses and legumes for pasture and hay. Management concerns are steepness of slope, low available water capacity, and stones on the surface. Brush and weed control is a continuing management concern. Girdling, cutting, or herbicides help to control brush and weeds. Controlled burning helps in seedbed preparation. A few areas are suited to operation of equipment.

Native grasses are better suited to the south- and west-facing slopes. Cool-season grasses are better suited to the north- and east-facing slopes, although brush control is more difficult on these slopes. Proper stocking rates, pasture rotation, deferred grazing, and adequate fertility help keep the pasture and soil in good condition.

Areas of this soil are suited to woodland wildlife habitat. A favorable diversity of plant species is in many areas. Some very small areas are suitable for food plots, especially those that have more gentle slopes and less stones on the surface. Woodland management such as leaving den trees, maintaining diversity of plants, and providing food and water encourages wildlife habitation.

This soil generally is not suitable for building site development and onsite waste disposal systems because of slope, depth to rock, and stones. However, onsite investigations are needed to determine if included areas are suitable for these uses.

This soil is in land capability classification VIe. The woodland ordination symbol is 4x.

7C—Jonca silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on ridgetops and side slopes. Areas are in a pattern along the stream divides. They range from 200 to several thousand acres.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 7 inches thick. The upper 20 inches of the subsoil is strong brown, firm silty clay loam and clay loam; the next 20 inches is a dense fragipan of yellowish brown, mottled, brittle loam; and the lower part of the subsoil to a depth of 62 inches is yellowish red, hard and brittle clay loam. Below this is hard sandstone. In some areas, sandstone bedrock is immediately below the fragipan. In some areas, the original surface layer has been removed by erosion and the present surface layer is strong brown, firm silty clay loam.

Included with this soil in mapping are areas of moderately deep, strongly sloping Lily soils on side

slopes and near the heads of drainageways. A few small areas of deep, well drained Lamotte soils that do not have a fragipan are lower on side slopes and nose slopes. Also included are a few small isolated areas of sandstone outcrop and areas smaller than an acre of shallow Ramsey soils. The included soils and sandstone outcrop make up 10 to 15 percent of mapped areas.

The permeability is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is medium, and available water capacity is low. Reaction ranges from medium acid to neutral in the surface layer, is strongly acid or very strongly acid in the subsoil, and is very strongly acid or extremely acid below the subsoil. The surface layer is friable and is easily tilled. The natural fertility is low, and the organic matter content is moderately low. The fragipan restricts rooting at a depth of about 32 to 38 inches. A water table is at a depth of 2 to 3 feet late in winter and in spring. The shrink-swell potential is moderate.

A few areas of this soil are used for cultivated crops. Corn, grain sorghum, and wheat are commonly grown and are suited. This soil is subject to severe erosion. Soil management concerns are controlling erosion and maintaining fertility. No-tillage systems help to protect this soil from excess erosion but can be difficult to use because of the wetness during spring. Residue left on the surface reduces the hazard of erosion but can delay drying. Cropping systems that include small grains, grass-legume meadows, or both of these effectively help to control erosion.

Most areas of this soil are used for forage crops. Grasses and legumes grown for pasture and hay effectively help reduce erosion. Alfalfa does not grow well because of the limited rooting depth of this soil and the susceptibility to frost heaving. Grazing when this soil is wet and overgrazing cause compaction and loss of stand. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

Areas of this soil are suited to trees. This soil does not have major hazards or limitations that affect the planting or harvesting of trees. Woodland needs protection from grazing.

This soil is suitable for building site development and onsite waste disposal systems if proper design and installation procedures are used. Wetness and the moderate shrink-swell potential affect basements. These limitations can be overcome by using adequate reinforcement in footings, foundations, and basement walls and by installing drainage tile to prevent damage caused by excess water. If sewage lagoons are used for onsite waste disposal, sites need to be leveled where slope is a concern and the bottom of the lagoon needs to be sealed with slowly permeable material where seepage is a concern.

This soil is in land capability classification IIIe. The woodland ordination symbol is 4o.

8C—Hildebrecht silt loam, 3 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on broad ridgetops. The ridgetops commonly are 500 to 1,300 feet wide. Areas tend to be oblong and in a pattern along the stream divides. They range from 200 to 4,000 acres.

Typically, the surface layer is dark brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 4 inches thick. To a depth of 38 inches the subsoil is brown and strong brown silty clay loam that is mottled in the lower part. Below this to a depth of 59 inches is a fragipan. It is strong brown, brittle, extremely cherty silt loam in the upper part and brown, mottled, brittle, extremely cherty silty clay loam in the lower part. The subsoil below the fragipan to a depth of 75 inches or more is dark red, mottled, firm very cherty clay.

Included with this soil in mapping are small areas of Wilderness soils. The Wilderness soils are cherty throughout and are common in saddles, knolls, narrow ridges, and strongly sloping areas within the ridge. The included soils make up about 5 to 10 percent of mapped areas.

The permeability is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is medium, and available water capacity is moderate. The surface layer is strongly acid or medium acid unless limed, and the subsoil is strongly acid to extremely acid throughout. The surface layer is friable and is easily tilled. The natural fertility is low, and the organic matter content is moderately low. Rooting depth is restricted by the fragipan at a depth of 25 to 40 inches. Late in winter and during spring a perched water table is above the fragipan at a depth of 24 to 30 inches. The shrink-swell potential in the subsoil is moderate.

A few areas of this soil are used for cultivated crops. Corn and grain sorghum are commonly grown. Because of the fragipan, plant roots are not able to penetrate deeply into the soil. Shortages of rainfall are common late in summer. Additional soil management concerns are soil erosion and low fertility. The combination of the silt loam surface layer and the slowly permeable fragipan makes this soil very erodible. Further erosion damage reduces effective rooting depth. Terraces are not a favorable practice because of the restricted rooting depth. No-tillage systems for spring crops are difficult to use on this soil because of the wetness during spring planting. No-tillage systems leave residue on the surface that can delay planting. Early planting is needed to avoid the dry soil condition late in summer. Cropping systems that include small grains, grass-legume meadows, or both of these effectively help to control erosion. Regular applications of soil amendments are needed to produce high yields.

Most areas of this soil are used for forage crops. Alfalfa does not produce well because of limited rooting depth and susceptibility to frost heaving. The fragipan causes this soil to be wet in spring and to be dry late in

summer. Grazing when this soil is wet and overgrazing cause compaction and loss of pasture stand, reduce the carrying capacity of the pasture, and increase the hazard of erosion. Proper stocking rates, pasture rotation, and restricted use during wet and dry periods help keep the pasture and soil in good condition.

This soil is suited to trees. Small areas remain in hardwoods, shortleaf pine, or mixtures of these species. Forested areas and woodlots need protection from grazing. This soil does not have limitations or hazards in the planting or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Wetness is a serious limitation for basements. This limitation can be partially overcome by drainage to lower the water table or by designing the basement above the water table. Installing drainage around footings and foundations helps prevent damage caused by excessive wetness. Adequate reinforcement of concrete helps overcome the shrinking and swelling of this soil. Sewage lagoons or properly constructed mound systems for absorption fields are adequate for onsite waste disposal. Bottoms of lagoons need to be sealed with slowly permeable material to prevent contamination of the ground water.

This soil is in land capability classification IIIe. The woodland ordination symbol is 4o.

8D—Hildebrecht silt loam, 9 to 14 percent slopes. This deep, strongly sloping, moderately well drained soil is on side slopes and foot slopes. Areas are irregular in shape and range from 10 to about 100 acres.

Typically, the surface layer is dark brown and yellowish brown silt loam about 8 inches thick. The upper 20 inches of the subsoil is brown silty clay loam. Next is a yellowish brown, mottled, brittle, very cherty silt loam fragipan about 10 inches thick. Below this to a depth of 60 inches or more the subsoil is dark red, firm cherty clay. In eroded spots, the plowed layer is brown silty clay loam.

The permeability is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is medium, and available water capacity is low. The surface layer is strongly acid or medium acid unless limed, and the subsoil is strongly acid or extremely acid throughout. The surface layer is friable and is easily tilled. The fragipan severely limits rooting to a depth of about 28 inches. The natural fertility is low, and the organic matter content is moderately low. Late in winter and during spring a perched water table is above the fragipan at a depth of 24 to 30 inches. The shrink-swell potential in the subsoil is moderate.

Most areas of this soil are used for forage crops. A few areas are used for cultivated crops. Soil erosion is the main hazard. Cropping systems that include small grains, grass-legume meadows, or both of these help to reduce soil losses from erosion. Large, deep-rooted legumes, such as alfalfa, generally do not produce well because of the limited rooting depth and susceptibility to frost heaving. The fragipan causes this soil to be wet in spring and to be dry late in summer. Grazing when the soil is too wet and overgrazing cause compaction and loss of stand, reduce carrying capacity of the pasture, and increase the hazard of erosion. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Soil amendments are needed to produce high yields.

This soil is suited to trees, and many areas remain in native hardwoods or shortleaf pine and hardwoods. Woodlots need protection from grazing. This soil does not have hazards or limitations for the planting or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Wetness is a limitation for basements. This limitation can be overcome by providing drainage to lower the water table or by constructing the basement above the water table. Installing drainage tile around footings and foundations helps prevent damage caused by excessive wetness. Providing adequate reinforcement steel in the concrete footings, foundations, and basement walls and backfilling with sand and gravel help overcome the shrinking and swelling of this soil. Sewage lagoons or mound systems for absorption fields are adequate for onsite waste disposal. Leveling of sites helps to modify slope. The bottoms of lagoons in some areas need sealing to prevent contamination of the ground water.

This soil is in land capability classification IVe. The woodland ordination symbol is 4o.

11C—Union silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on wide ridgetops and divides. Areas generally are oblong and irregular in shape. They range from 50 to several hundred acres.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil to a depth of 36 inches is strong brown and brown, firm silty clay loam. Below this is a brown and yellowish red, mottled, brittle, extremely cherty clay loam fragipan about 16 inches thick. The lower part of the subsoil to a depth of 64 inches or more is dark red, mottled, very firm cherty clay. In eroded spots, the surface layer is brown silty clay loam.

Included with this soil in mapping are areas about 4 acres or less of Auxvasse soils. The Auxvasse soils on foot slopes are grayer than this Union soil and do not have a fragipan. Also included are small areas of Wilderness soils in small drainageways and on steeper positions. These soils have more chert than this Union soil. The included soils make up about 5 percent of mapped areas.

The permeability of this soil is slow, runoff is medium, and available water capacity is moderate. Reaction is medium acid to neutral in the surface layer, very strongly acid to medium acid in the subsoil, and very strongly acid or extremely acid in the fragipan. The surface layer is friable and is easily tilled, except in a few eroded places or spots that contain excessive chert. The natural fertility is low, and the organic matter content is moderately low. Late in winter and during spring a water table is at a depth of 1.5 to 3 feet. Rooting is restricted by the fragipan at a depth of 27 to 40 inches. The shrink-swell potential is moderate.

A few areas of this soil are used for cultivated crops. Corn, grain sorghum, and wheat are suited and are commonly grown. Because of the fragipan, plant roots are not able to penetrate deeply into the soil and shortages of rainfall are common in mid and late summer. Soil management concerns are controlling erosion and maintaining fertility. This soil is very erodible, and further erosion reduces the rooting depth and available water capacity. No-tillage systems and crop residue left on the surface help reduce erosion but increase the soil wetness, which may delay planting. Early plantings are needed to avoid the droughtiness late in summer. Cropping systems that include small grains, grass-legume meadows, or both of these effectively help to control erosion. Regular applications of soil amendments are needed to produce high yields.

Most areas of this soil are used for forage crops. Grazing when this soil is too wet and overgrazing cause compaction and loss of stand. These result in a decrease in the carrying capacity of the pasture and in an increase in erosion. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition. Soil amendments are needed to produce high yields.

This soil is suited to trees. Some areas remain in shortleaf pine and a mixture of hardwoods. Water saturation in the upper part of this soil is a limitation to the use of equipment late in winter and during spring. Skidding, loading, and hauling logs after excess moisture is gone from the soil reduce rutting and miring. Woodlots need protection from grazing.

This soil is suitable for building site development and onsite waste disposal systems if proper design and installation procedures are used. Adequate drainage of excess water is needed to assure dry basements because of a seasonal high water table. Footings and foundations should be constructed with adequate reinforcement and should be backfilled with sand or gravel to prevent damage caused by shrinking and swelling. Sewage lagoons are suitable for onsite water disposal; however, some leveling is necessary to construct a site.

This soil is in land capability classification IIIe. The woodland ordination symbol is 4o.

12E—Goss cherty silt loam, 14 to 35 percent slopes. This deep, moderately steep and steep, well drained soil is on upland side slopes. Areas are broad and irregular in shape and range from 50 to several thousand acres.

Typically, the surface layer is dark brown cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish red, friable very cherty silty clay loam; the next part is dark red, firm and very firm very cherty clay; and the lower part to a depth of about 60 inches is dusky red, very firm cherty clay. In some areas, the surface layer contains less than 15 percent chert. The subsoil is less clayey in some areas and has thick silty clay loam horizons.

Included with this soil in mapping are small areas of Hildebrecht, Union, and Wilderness soils on narrow ridgetops and foot slopes. These soils have a fragipan. Also included are shallow Gasconade soils lower on the side slopes and somewhat excessively drained Midco soils on stream bottoms. The included soils make up about 10 to 15 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is rapid, and available water capacity is low. Reaction ranges from neutral to strongly acid in the surface layer, from slightly acid to strongly acid in the upper part of the subsoil, and from strongly acid to neutral in the lower part of the subsoil. The surface layer is friable but difficult to till because of the chert content. The natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential in the subsoil is moderate.

This soil generally is not suited to cultivated crops. The steep slopes, severe erosion hazard, and low available water capacity are the main limitations. These limitations also apply to the use of this soil for forage crops.

A few areas of this soil are used for pasture. Pasture establishment and management are more favorable in areas where slopes are less than about 20 percent. In establishing pasture, minimum disturbance in seedbed preparation helps to reduce erosion. Controlled burning can be used in seedbed preparation. Brush and weed control is a continuing concern on steep slopes because of the equipment limitations. Girdling, cutting, and herbicides can be used for brush and weed control. Native grasses are better suited to the south- and west-facing slopes, and cool-season grasses are better suited to the north- and east-facing slopes. Proper stocking rates and pasture rotation help prevent overgrazing and help keep the pasture in good condition. These measures also reduce competition from weeds and help to control soil erosion.

This soil is suited to trees, and most areas are wooded. In many areas a mixture of shortleaf pine and hardwoods grows on the south- and west-facing slopes. Hardwoods, mainly white oak and northern red oak, grow

on the north- and east-facing slopes. Some areas have low quality hardwoods because of indiscriminate cutting, wildfire, and overgrazing. Older tree growth of low quality should be removed to provide room for young, more vigorous trees. Seedling mortality is a limitation. Protection from wildfire and grazing helps encourage natural reproduction of desirable species. Planting container-grown stock or stock of a larger size than usual helps achieve better survival. Hand planting of seedlings is necessary in some areas.

Areas in which the surface layer contains only small amounts of chert are more favorable for planting. Erosion and equipment limitations are concerns when harvesting trees. They can be partially overcome by careful selection and maintenance of logging roads and skid trails. The roads and trails should be constructed on the contour where possible, and, on the steep positions, logs should be yarded uphill. Abandoned roads and trails may need seeding when harvesting is complete.

Woodland wildlife habitat can be improved by providing food and cover. Brushy thickets can be established by clearing small areas in large areas of mature woodland. Food plots or green browse areas can be planted along roads and trails. Areas that produce native plants can be improved by disking and fertilizing.

This soil generally is not suitable for building site development because of steep slopes. This soil commonly is used as a site for pond reservoirs. Excessive seepage is common. A dispersant type sealer, such as soda ash or other special treatment, is commonly needed to seal the bottom and sides of the reservoirs. In pond dams, the cherty clay material is difficult to compact because of high clay content and large pieces of chert.

This soil is in land capability classification VIIs. The woodland ordination symbol is 4f.

14C—Minnith silt loam, 3 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on upland ridgetops and side slopes. Areas along the ridgetops are long, narrow, and twisting; areas on foot slopes and nose slopes are broad and irregular in shape. Areas range from 10 to about 200 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is dark yellowish brown silt loam about 4 inches thick. The subsoil is about 50 inches thick. The upper part is brown silt loam and silty clay loam, and the lower part is brown clay loam and dark yellowish brown loam and has common light brownish gray mottles. The substratum to a depth of 60 inches or more is strong brown, mottled loam. In some areas, the subsoil is brittle at a depth of 20 to 30 inches.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is high. Reaction ranges from very strongly acid to neutral. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. Air and water movement and root penetration are slightly restricted from the upper part of the subsoil to the lower part because of the differences in material. Depth to the seasonal high water table is 3 to 5 feet. The shrink-well potential is moderate.

Some areas of this soil are cultivated. They are suited to corn, soybeans, and wheat. If this soil is used for cultivated cropland, it is easily eroded. The major soil management concerns are keeping erosion to a minimum and maintaining soil tilth. Terraces, no-tillage systems, or cropping systems that include small grains, grass-legume meadows, or both of these help to control soil erosion. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface help to keep the soil in good tilth. Soil amendments are needed to maintain high yields. The amount depends on the crop grown.

This soil is suited to grasses and legumes. Because of internal wetness, red clover is better suited than alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility keep pasture in good condition.

This soil is suited to trees, and a few areas remain in native hardwoods. Woodlots need protection from grazing and trampling by livestock. This soil does not have major hazards or limitations in the planting, growing, or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Construction that provides adequate reinforcement of footings and foundations and backfilling with sand or gravel help to prevent damage caused by the shrinking and swelling of the soil. The moderately slow permeability is a severe limitation for the use of this soil as a conventional septic tank absorption field. Sewage lagoons or mound systems for absorption fields are adequate for treatment of waste. Areas should be leveled for lagoon sites; however, in some areas the bottom of the lagoon requires sealing with slowly permeable material to prevent seepage.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

14D—Minnith silt loam, 9 to 14 percent slopes. This deep, strongly sloping, moderately well drained soil is on upland side slopes. Areas are oblong and irregular in shape. They range from narrow strips of 15 acres to broad bands of 500 to 600 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown silt loam and dark yellowish brown silty clay loam, and the lower part is dark yellowish brown clay loam and yellowish brown loam and has common light brownish gray

mottles. The substratum is strong brown, mottled loam. Hard sandstone is at a depth of about 85 inches. In eroded areas, the surface layer is silty clay loam. Gullies are common. Some areas are moderately steep.

Included with this soil in mapping are small areas of deep, well drained Lamotte soils and moderately deep, well drained Lily soils. Also included are occasional outcrops of rock. The included soils and outcrops are lower on side slopes than this Minnith soil. They make up less than 10 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is high. Reaction is slightly acid or neutral in the surface layer and very strongly acid to slightly acid in the subsoil. The surface layer is friable and is easily tilled except in a few eroded spots where the surface layer is firm silty clay loam and tends to form clods and become hard. The natural fertility is medium, and the organic matter content commonly is moderately low. Depth to the seasonal high water table is 3 to 5 feet. The shrink-swell potential is moderate.

A small acreage of this soil is used for cropland. Corn and wheat are common crops. This soil is suited to corn and wheat if it is adequately protected from erosion. No-tillage systems or crop rotations are needed to keep soil erosion to a minimum. Other management concerns are maintaining soil tilth and fertility. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep this soil in good tilth. Moderate amounts of soil amendments are needed to maintain high yields.

Most areas of this soil are used for pastureland and hayland. Grasses and legumes are suited; however, clovers are better suited than alfalfa because of the internal wetness. Well managed pasture effectively helps to control erosion. Preventing overgrazing and maintaining fertility keep pasture in good condition.

This soil is suited to trees. A few areas remain in native hardwoods, and there are a few pine plantations. Woodlots need protection from grazing and trampling by livestock. This soil does not have hazards or limitations in the planting, growing, or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Construction sites in some areas require landshaping to modify slope. Footings, foundations, and basement walls need adequate reinforcement steel and backfilling with sand or gravel to withstand the shrinking and swelling of this soil. Leveling helps to modify slope, and sealing of sewage lagoons helps to prevent seepage.

This soil is in land capability classification IVe. The woodland ordination symbol is 3o.

15F—Goss-Menfro complex, 14 to 45 percent slopes. This complex consists of deep, moderately steep to very steep, well drained soils on side slopes. Areas range from 100 to 4,000 acres. They are about 60 percent Goss soils and 20 percent Menfro soils. Individual areas of these soils are so intricately mixed or so small that to separate them in mapping was not practical. The Menfro soils commonly are on north- and east-facing slopes, narrow ridges, and foot slopes. The Goss soils commonly are on side slopes below Menfro soils.

Typically, the Goss soils have a surface layer of dark brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam about 5 inches thick. The subsoil is more than 60 inches thick. The upper part is brown very cherty silty clay loam, and the lower part is red and dark red, very firm very cherty clay.

Typically, the Menfro soils have a thin surface layer of dark grayish brown silt loam and a subsurface layer of yellowish brown silt loam. The combined thickness of these layers is about 7 inches. The subsoil is brown silt loam and silty clay loam about 40 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the surface soil is as much as 20 percent chert.

Included with these soils in mapping and making up about 5 percent of mapped areas are small areas of shallow Gasconade soils. The Gasconade soils are scattered throughout the areas of Goss soils and can be identified by the presence of eastern redcedar and other plants that grow on dry sites. Also included are a few areas in which the surface layer is chert free.

The permeability of these soils is moderate, and surface runoff is rapid. Available water capacity is high in the Menfro soils and low in the Goss soils. Reaction ranges from neutral to strongly acid in the surface layer, commonly strongly acid or medium acid in the subsoil above a depth of 40 inches, and commonly less acid below a depth of 40 inches. The surface layer is friable, but chert content is a hindrance to tillage in many places. Natural fertility ranges from low in the Goss soils to medium in the Menfro soils. In both soils, the organic matter content commonly is low. The shrink-swell potential is moderate in the subsoil of both soils.

This complex is suited to forage. Some areas have been cleared and are used for pasture. Pasture management concerns are controlling brush and erosion. Areas in which the surface contains less chert and where slopes are more gentle are the most favorable for pasture establishment and management. Preventing overgrazing and maintaining fertility keep the pasture in good condition and effectively help to control erosion. Special attention should be given to prevent erosion during establishment or renovation. Maintenance of grassed waterways, planting on the contour, interplanting small grains, and minimum seedbed preparation help prevent excessive erosion.

This complex is suited to trees. Most areas remain in native hardwoods. Limitations are erosion, operation of

equipment, and seedling mortality. Limitations are more severe on the Goss soils than on the Menfro soils. Areas in which the surface contains less chert are more favorable for plantings. Careful selection and maintenance of roads and trails help prevent excess erosion and allow safe operation of equipment. Logging roads need to be constructed on the contour where possible, and in the steepest areas logs should be yarded uphill to the roads and trails. When abandoned, roads and trails should be seeded to protective cover. Selecting planting stock that are larger than typical helps achieve a better survival rate. North- and east-facing slopes where drying is less severe are favored for planting. The woodland needs to be protected from wildfire and grazing.

Woodland wildlife habitat can be improved by providing food and green browse. Food plants and grasses and legumes need to be seeded along logging roads and skid trails or in clearings. Grain crops and legumes can be grown on nearby soils that are more suitable for tillage. Woodland wildlife habitat and improvement of the habitat are more favorable on the Menfro soils than on the Goss soils.

These soils generally are not suited to building site development and onsite waste disposal systems because of the steep slopes.

This complex is in land capability classificaiton VIIs. The woodland ordination symbol is 4f for Goss soils and 3r for Menfro soils.

16C—Menfro silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, well drained soil is on ridgetops and foot slopes. It formed in deep loess. Areas are oblong and range from 10 to 600 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is brown silty clay loam about 45 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam. In some areas, the subsoil is redder between depths of 40 and 60 inches. In a few areas, slopes are less than 3 percent or more than 9 percent. In some eroded areas, the plow layer is brown silty clay loam.

Included with this soil in mapping are small areas of Gasconade and Haymond soils. The Gasconade soils are lower on the side slopes than this Menfro soil and are shallow to bedrock. The Haymond soils have less clay and are along small drainageways. The included soils make up 5 to 10 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is medium, and available water capacity is high. Reaction ranges from strongly acid to neutral. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture. The natural fertility is medium, and the organic matter content commonly is moderately low. The shrink-swell potential is moderate.

This soil is suited to cultivated crops. Most areas are used for grain and forage crops. Corn, wheat, and soybeans are most commonly grown. The major soil management concerns are controlling soil erosion and maintaining good tilth. In most areas, terraces, no-tillage systems, and crop systems that include small grains, grass-legume meadows, or both of these are needed to help control erosion. No-tillage systems are effective where terraces are not practical. Plowpans or traffic pans form in cultivated fields, especially where the organic matter content is low. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good physical condition. Soil amendments are needed to maintain high yields.

This soil is suited to grasses and legumes, including alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility keep the pasture in good condition.

This soil is suited to trees, and some areas remain in native hardwoods. This soil does not have major hazards or limitations in the planting, growing, or harvesting of trees. Woodland should be protected from grazing.

This soil is suitable for building site development. The moderate shrink-swell potential can be overcome by adequate reinforcement steel in footings, foundations, and basement walls. Septic tank absorption fields work well. Sewage lagoon sites need to be leveled, and the bottom of the reservoir requires sealing to prevent excess seepage.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

16D2—Menfro silt loam, 9 to 14 percent slopes, eroded. This deep, strongly sloping, well drained soil is on upland side slopes. Areas are generally oblong and range from 20 to 200 acres.

Typically, the surface layer is mixed, dark yellowish brown silt loam and brown silty clay loam about 7 inches thick. The subsoil is brown silty clay loam about 45 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the subsoil is redder between depths of 40 and 60 inches.

Included with this soil in mapping are small areas of Gasconade and Goss soils. The Gasconade soils are shallow to bedrock, and the Goss soils are cherty. Both of these soils are in steep areas and are commonly wooded. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is medium, and available water capacity is high. Reaction ranges from strongly acid to neutral. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture. The natural fertility is medium, and the organic matter content commonly is moderately low. The solum does not have serious

restrictions to root development. The shrink-swell potential is moderate.

This soil is suited to cultivated crops. Most areas are used for grain and forage crops. Corn and wheat are commonly grown. Effectively controlling erosion and keeping the soil in good tilth are major soil management concerns. Both terraces and crop rotations are needed for erosion control. No-tillage systems help to increase the number of years grain crops can be included in a rotation. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content help keep the soil in good condition. Soil amendments are needed to maintain high yields.

This soil is suited to grasses and legumes, including alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help keep pasture in favorable condition.

Areas of this soil are suited to trees, and a few areas remain in native hardwoods. This soil does not have major hazards or limitations that restrict the planting, growing, or harvesting of trees. The woodlands should be protected from grazing.

This soil is suitable for building site development. The moderate shrink-swell potential can be overcome by providing adequate reinforcement steel in footings, foundations, and basement walls. Sites for dwellings, septic tank absorption fields, and sewage lagoons need landshaping and leveling to modify slope. The reservoirs of sewage lagoons need to be sealed to reduce seepage.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

16E2—Menfro silt loam, 14 to 20 percent slopes, eroded. This deep, moderately steep, well drained soil is on upland side slopes. Areas range from 20 to 200 acres and commonly border stream bottoms.

Typically, the surface layer is mixed, dark brown silt loam and brown silty clay loam about 7 inches thick. The subsoil is brown silty clay loam to a depth of about 31 inches. The substratum to a depth of 60 inches is brown silt loam. In several areas, the subsoil is redder between depths of 40 and 60 inches. In eroded areas, the plow layer is mixed, dark brown silt loam and dark yellowish brown silty clay loam.

Included with this soil in mapping are small areas of Gasconade and Goss soils. The Gasconade soils are shallow to bedrock, and the Goss soils are cherty. Both of these soils are in the steeper areas and commonly are wooded. The included soils make up about 12 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is rapid, and available water capacity is high. Reaction ranges from strongly acid to neutral. The surface layer is friable but is subject to erosion if tilled. The natural fertility is medium, and the organic matter content is moderately low. The shrink-swell potential is moderate.

This soil generally is not suited to cultivated crops, unless intensive measures are taken to prevent soil erosion. In most areas, a no-tillage system either in rotation with meadow or in a combination with terraces is needed to help prevent erosion.

This soil is suited to grasses and legumes, including alfalfa. Most areas are used for forage crops. Well managed stands of grasses or legumes are effective in reducing erosion. The hazard of erosion during establishment or renovation is a management concern, particularly with slow starting legumes, such as alfalfa or red clover. Maintenance of grassed waterways, planting on the contour, interplanting of small grains, good seedbed preparation, and application of fertilizer help to prevent excessive erosion. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition. Moderate amounts of soil amendments are needed for most crops.

Areas of this soil are suited to trees. About one-fourth of the acreage remains in native hardwoods. The hazards of erosion, equipment use, and seedling mortality are moderate because of the steepness of slope. Constructing roads and skid trails on the contour and properly maintaining them help to control erosion and assure safety in operating equipment. Larger size planting stock achieves better seedling survival. Woodland should be protected from grazing and wildfire.

This soil generally is not suitable for building site development because of the moderately steep slopes.

This soil is in land capability classification IVe. The woodland ordination symbol is 3r.

17C—Menfro silt loam, karst, 2 to 14 percent slopes. This deep, undulating to rolling, well drained soil is on broad karst plains. Areas of this soil do not have a well defined surface drainage pattern. A few streams cut into areas, and several small streams enter underground drainageways through sinkholes. Sinkhole ponds are common. Most individual sinkholes are less than about 2 acres. The large compound sinkholes can receive drainage from as much as 800 acres. Areas are very irregular in shape and commonly are several hundred acres to a thousand acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is brown silty clay loam about 45 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the subsoil is redder between depths of 40 and 60 inches. In many small eroded areas, the plow layer is brown silty clay loam.

Included with this soil in mapping are a few very small areas that are shallow to bedrock and some areas in which stones or outcrops of rock are on the surface near the bottom of sinkholes. Also included are some small areas of nearly level Haymond soils on the bottoms of

larger sinkholes and drainageways. The included soils make up about 5 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is medium, and available water capacity is high. Reaction is medium acid to neutral because of liming. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture. The natural fertility is moderate, and the organic matter content is moderately low. The shrink-swell potential is moderate.

This soil is suited to corn, wheat, and soybeans. Most areas are used for grain crops. The major soil management concerns are keeping erosion to a minimum and maintaining tilth. This soil is easily eroded by moving water. No-tillage systems and crop systems that include small grains, grass-legume meadow, or both of these are needed to help reduce the erosion. Only a few areas have slopes that are long enough and smooth enough to be terraced and farmed on the contour. Plowpans or traffic pans form readily in cultivated fields if conventional tillage systems are used and if the organic matter content is low. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth.

This soil is suited to grasses and legumes, including alfalfa. Growing grasses and legumes for hay or pasture effectively helps to control erosion. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition.

Areas of this soil are suited to trees, and some small areas remain in hardwoods. This soil does not have hazards or limitations that affect the planting, growing, or harvesting of trees. Woodlots should be protected from grazing.

Many areas of this soil are suitable for building site development and for waste disposal systems. Sinkhole areas are not suitable because of the hazards of local flooding, possible sinkhole collapse, and rapid contamination of ground water. Major limitations of this soil are moderate shrink-swell potential, slope, and seepage. Adequate reinforcement steel in concrete and proper drainage help to prevent damage to basements and footings. If properly constructed, septic tank absorption fields function adequately. Sewage lagoons provide adequate treatment if the site is leveled to modify the slope and the reservoir is sealed to prevent excess seepage.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

17E—Menfro silt loam, karst, 9 to 35 percent slopes. This deep, rolling to steep, well drained soil is on broad karst plains. Areas of this soil do not have a well defined surface drainage pattern. Several small streams enter underground drainageways through sinkholes. Sinkholes and sinkhole ponds are very common. Most individual sinkholes range from 1 acre to about 6 acres. The large, compound sinkholes may receive drainage from as much as 400 acres. Areas are very irregular in shape and are commonly several hundred acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is brown silty clay loam about 46 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the subsoil is redder between a depth of 40 and 60 inches. In occasional eroded areas, the surface layer is brown silty clay loam.

Included with this soil in mapping are about 12 percent Goss and Haymond soils. The Goss soils have a red cherty clay subsoil and are on side slopes of sinkholes. The Haymond soils are nearly level, have less clay than this Menfro soil, and are on the bottoms of larger sinkholes and drainageways. Also included are a few very small areas that are shallow to bedrock and some areas that have stones or outcrops of rock on the surface near the bottom of sinkholes. Many ridges among the sinkholes have gentle slopes. Some sinkholes have side slopes that are very steep.

The permeability of this soil is moderate, runoff is medium, and available water capacity is high. Reaction ranges from medium acid to neutral throughout the profile because of liming. The surface layer is friable and is easily tilled through a wide range of soil moisture. The natural fertility is moderate, and the organic matter content is moderately low. The shrink-swell potential is moderate.

Most areas are used for forage crops. This soil generally is not suited to cultivated crops. Some small, less sloping areas are suited to small fields and gardens if intensive measures are taken to prevent soil loss. In most cropland a no-tillage system in rotation with meadow is needed to reduce soil losses. Few areas have slopes smooth enough to be terraced.

Well managed stands of grasses or legumes are effective in reducing erosion. Several species of grasses and legumes, including alfalfa, are suited. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition. Moderate amounts of soil amendments are needed for most crops. The hazard of erosion during establishment or renovation of crops is a management concern. Maintenance of grassed waterways, planting on the contour, interplanting of small grains, good seedbed preparation, and application of fertilizer help to prevent erosion.

Some steeper areas are not suited to the operation of pasture management equipment and are better utilized as woodland.

This soil is suited to trees, and about 30 percent of the acreage is in native hardwoods. The hazard of erosion and the restricted use of equipment are limitations that can be overcome by careful placement and maintenance of roads and skid trails. These limitation are slope

related, and their intensity increases as the slope increases. Woodlots should be protected from grazing.

This soil generally is not suited to building sites because of excessive slope and the hazard of erosion. Many areas are not suited because of local flooding, sinkhole collapse, and possible contamination of ground water.

This soil is in land capability classification VIe. The woodland ordination symbol is 3r.

18F—Gasconade-Menfro complex, 14 to 50 percent slopes. This complex consists of shallow, steep and very steep, somewhat excessively drained Gasconade soils and deep, moderately steep, well drained Menfro soils on uplands. This complex generally is on the lower part of rugged hills. Gasconade soils are on the steeper parts of areas and are commonly on south- and west-facing slopes. About 10 percent of their surface is covered with outcrops of rock and limestone, 15 to 24 inches long. Menfro soils are on foot slopes and on north- and east-facing slopes. Areas range from 40 to 2,000 acres. They are about 50 percent Gasconade soils and 30 percent Menfro soils. Individual areas of these soils are so intricately mixed or small that to separate them in mapping was not practical.

Typically, the Gasconade soils have a surface layer of very dark grayish brown stony silty clay loam about 9 inches thick. The subsoil is dark brown stony silty clay about 4 inches thick. Below this is hard limestone.

Typically, the Menfro soils have a surface layer of dark brown silt loam about 9 inches thick. The subsoil is brown silty clay loam about 40 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some places, the surface contains as much as 20 percent chert. In some areas, the subsoil is reddish brown between a depth of 20 and 40 inches.

Included with these soils in mapping are about 1 percent outcrops of rock. Commonly the outcrops are at a fairly uniform elevation and give a contoured, ledgelike appearance to the hillsides. The use of equipment is a management concern. Also included are about 8 percent moderately deep Caneyville soils on positions similar to those of the Gasconade soils and about 3 percent Bloomsdale soils along small stream bottoms. These bottoms are less than about 250 feet in width, and generally tree growth is much better on the bottoms than on the adjacent uplands.

In the Gasconade soils permeability is moderately slow, runoff is rapid, and available water capacity is very low. The surface layer contains stones and other rock fragments. Reaction is slightly acid or neutral. Organic matter content is moderate, and natural fertility is high. Effective rooting depth is about 12 inches because of the depth to bedrock. The shrink-swell potential is moderate.

In the Menfro soils permeability is moderate, runoff is rapid, and available water capacity is high. Reaction ranges from strongly acid to neutral. The surface layer is friable but in a few areas contains chert. The organic matter content is moderately low, and the natural fertility is medium. Effective rooting depth is 60 inches or more. The shrink-swell potential in the subsoil is moderate.

Most areas are in woodland. A few areas are used for pasture. These soils are suited to pasture, woodland, habitat for woodland wildlife, and recreational uses. The main pasture management concern is maintaining adequate cover to reduce erosion and to control weeds. Most areas of the Gasconade soils produce native grasses, such as big bluestem, indiangrass, and sideoats grama. These grasses can be managed for pasture by controlled grazing. Seedbed preparation and brush control are difficult because of the rough, stony surface and steep slopes. Areas of the Menfro soils, especially on more gentle slopes, are favorable for pasture establishment and management. The hazard of erosion during establishment or renovation is a management concern.

The suitability of areas as woodland varies with the soil. Generally, the Gasconade soils produce trees of low quality. Eastern redcedar and chinkapin oak are common species. Posts, firewood, and poles are the main products. The areas of Gasconade soils are utilized by woodland wildlife, but cover, nesting places, and food are limited. In contrast, the Menfro soils produce high quality trees. This is because the soils are deep and are on favorable positions in the landscape. The favorable positions are the lower part of the hills on the north- and east-facing slopes. The hazards of erosion, use of equipment, and seedling mortality are concerns in management. The hazards are more severe on Gasconade soils than on Menfro soils. The hazard of erosion in woodlands is caused by the construction of logging roads and trails. Careful layout and maintenance of these roads and trails help reduce erosion. Temporary roads can be seeded after use to provide green browse for wildlife. Logging roads should be constructed on the contour. The forest needs to be protected from grazing and wildfire.

In the steepest positions, logs can be skidded or yarded upslope to roads. Seedling mortality is moderate. This can be overcome by planting larger than usual stock and favoring north- and east-facing slopes for planting where drying is less severe. Natural seedling reproduction needs to be encouraged in most areas before the main harvest.

Woodland wildlife habitat can be improved by providing food and cover. Brush thickets, produced by clearing small areas, provide diversity in large areas of mature woodland. Food plots or green browse areas can be planted along logging roads and trails. Disking and fertilizing encourage the growth of native plants.

These soils generally are not suited to building sites and onsite waste disposal systems because of the steep slopes.

These soils are in land capability classification VIIs. The woodland ordination symbol for the Gasconade soils is 5x and for the Menfro soils is 3r.

19C—Crider silt loam 3 to 9 percent slopes. This deep, gently sloping, well drained soil is on broad ridges. Areas tend to be oblong and in a pattern of the stream divides. Areas range from 50 to 300 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The upper part of the subsoil to a depth of about 29 inches is brown, very friable silt loam and firm silty clay loam; the middle part is red, firm silty clay loam; and the lower part to a depth of about 65 inches is red, very firm silty clay. In a few eroded areas, the surface layer is silty clay loam. In some areas, the lower part of the subsoil commonly has olive or olive brown mottles. On a few strongly sloping positions are areas of about 5 acres or less in small draws.

Included with this soil in mapping are areas of Caneyville, Fourche, Gasconade, and Haymond soils. The Caneyville soils are moderately deep and are on isolated small ridges, lower parts of side slopes, and heads of drainageways. Less than 8 acre areas of Fourche soils are on the broader ridges. These soils have gray mottles in the lower part of the subsoil. The Gasconade soils are shallow to bedrock and are in small areas on lower side slopes. The Haymond soils are silt loam throughout and are on small stream bottoms. The included soils make up about 10 to 15 percent of mapped areas.

The permeability of this soil is moderate, runoff is medium, and available water capacity is high. Reaction ranges from very strongly acid to slightly acid in the subsoil and varies widely in the surface layer as a result of local liming. The surface layer is friable and is easily tilled through a wide range of soil moisture. The natural fertility is medium, and the organic matter content is moderate. The shrink-swell potential is moderate in the lower part of the subsoil.

This soil is suited to corn, soybeans, and wheat. Most areas are used for forage or cultivated crops. Major soil management concerns are keeping erosion to a minimum and maintaining tilth. This soil is easily eroded by moving water. In most areas, terraces, no-tillage systems, and cropping systems that include small grains, grass-legume meadows, or both of these help to reduce erosion. No-tillage systems are effective where terraces are not practical because of uneven slopes. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Keeping tillage to a minimum, subsoiling or chiseling, and maintaining organic matter content help keep the soil in good tilth. Soil amendments are needed to maintain high yields.

This soil is suited to grasses and legumes, including alfalfa. Pasture in good condition is effective in helping to control erosion. Preventing overgrazing and maintaining fertility keep the pasture in good condition.

Areas of this soil are suited to trees for wood crops and for orchards. Some areas remain in native hardwoods, and a few areas of trees remain as small woodlots or along fence rows and drainageways. Woodlots need protection from grazing and trampling by livestock. This soil does not have hazards or limitations in the planting or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems where proper design and installation procedures are used. Septic tank absorption fields work favorably. Adequate reinforcement of concrete footings, foundations, and basement walls is needed to prevent damage caused by shrinking and swelling in the lower part of the subsoil. If this soil is used for pond reservoir areas, excessive seepage is a common concern. A dispersant type of sealant or an impermeable liner is needed to seal the bottom of the reservoir.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

19D—Crider silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is above small drainageways and on foot slopes of higher hills. Areas tend to be oblong and range from 10 to about 60 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil to a depth of about 36 inches is reddish brown and dark reddish brown silty clay loam, and the lower part to a depth of about 60 inches is dark red silty clay. Eroded areas are common, and in some the plow layer is reddish brown silty clay loam. In some areas, the lower part of the subsoil contains stones or columns of bedrock.

Included with this soil in mapping are small areas of soil that are on foot slopes and have a cherty surface layer. Gullies are common in these areas. Also included are small isolated areas of moderately deep Caneyville soils. The included soils make up about 5 to 10 percent of mapped areas.

The permeability of this soil is moderate, runoff is medium, and available water capacity is high. Reaction ranges from very strongly acid to slightly acid in the subsoil and varies widely in the surface layer as a result of local liming. The surface layer is friable and is easily tilled through a wide range of soil moisture. The natural fertility is medium, and the organic matter content is moderate. The shrink-swell potential is moderate in the lower part of the subsoil.

This soil is suited to and mostly used for forage and cultivated crops. Corn and wheat are commonly grown. Effectively controlling erosion and keeping the soil in good tilth are major soil management concerns. Terraces or crop rotations are needed to help reduce erosion. Most rotations should have about 4 out of 5 years in grass or legume meadow. No-tillage systems increase the number of years grain crops can be kept in a

rotation. Keeping tillage to a minimum, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth. Moderate amounts of soil amendments are needed to maintain high yields.

This soil is suited to grasses and legumes, including alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility keep the pasture in good condition.

Areas of this soil are suited to trees, and a few areas of mixed hardwoods remain as small woodlots. Woodlots need protection from grazing and trampling by livestock. This soil does not have major limitations in the planting, growing, or harvesting of trees.

This soil is suitable for building site development. The shrink-swell potential is a hazard for dwellings. Adequate reinforcement of concrete and drainage prevent damage to basements and footings. Slope is a limitation to dwellings and septic tank absorption fields and can be effectively reduced by landshaping or leveling. Dwellings and absorption fields should be designed to conform to the natural slope of the landscape. If this soil is used for pond reservoir areas, excessive seepage is a common concern. A dispersant type of sealant or an impermeable liner is needed to seal the bottom of the reservoir.

This soil is in land capability classification IVe. The woodland ordination symbol is 3o.

20B—Fourche silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil commonly is on upland ridgetops. Areas are irregular in shape and range from 20 to 1,500 acres.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown silty clay loam; the middle part is strong brown, mottled, silty clay loam; and the lower part to a depth of about 74 inches is yellowish brown silty clay with many black stains.

Included with this soil in mapping are small areas of Gerald and Nicholson soils. These soils have a fragipan and are on higher parts of ridges. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is high. Reaction commonly is slightly acid or neutral in the surface layer and ranges from very strongly acid to neutral in the subsoil. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. In most years, a high water table is at a depth of 1 1/2 to 3 feet during winter and spring. The shrink-swell potential is moderate.

This soil is suited to and mostly used for cultivated crops and forage. Corn, soybeans, and wheat are commonly grown. Major soil management concerns are keeping erosion to a minimum and maintaining soil tilth. Terraces, no-tillage systems, and cropping systems that include small grains, grass-legume meadows, or both of these help to reduce soil erosion. No-tillage systems are effective in helping to control erosion in areas where terraces are not practical. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Reduced tillage operations, subsoiling, chiseling, and leaving large amounts of residue on the surface help to keep the soil in good condition.

This soil is suited to grasses and legumes. Red clover is better suited to this soil than alfalfa because of the wetness resulting from moderately slow permeability in the subsoil. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help keep the pasture in good condition.

Areas of this soil are suited to trees. A few areas remain in native hardwoods as small woodlots and along fence rows and drainageways. Woodlots need protection from grazing and trampling by livestock This soil does not have major hazards or limitations in the planting, growing, and harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Construction that assures adequate reinforcement in footings, foundations, and basement walls helps to overcome the shrinking and swelling of this soil. The sealing of basements and the drainage of excess water are needed because of the seasonal high water table. The seasonal high water table is a severe limitation for the use of this soil as a conventional septic tank absorption field. Properly constructed sewage lagoons or mound systems for absorption fields are adequate for waste disposal. Sealing the bottom of lagoons with a slowly permeable material helps to prevent contamination of the ground water.

This soil is in land capability classification IIe. The woodland ordination symbol is 3o.

20C—Fourche silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on upland side slopes. Areas are irregular in shape and commonly range from 20 to 150 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The upper part of the subsoil to a depth of about 27 inches is brown, firm silty clay loam; the next part is a transitional layer of reddish brown silty clay loam; and the lower part to a depth of about 76 inches is reddish brown, mottled, firm silty clay. In eroded areas, the surface layer commonly is mixed silt loam and silty clay loam. In some areas, the upper part of the subsoil is mottled with grayish brown.

Included with this soil in mapping are small areas of well drained Caneyville and Crider soils and moderately well drained Nicholson soils. The Caneyville soils are moderately deep to bedrock and are on foot slopes or around the heads of small drainageways. The Crider soils are on ridgetops and nose slopes. The Nicholson

soils have a fragipan and are on ridgetops. The included soils make up about 15 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is medium, and available water capacity is high. Reaction is medium acid to neutral in the surface layer and very strongly acid to neutral in the subsoil. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. A seasonal high water table is at a depth of 1 1/2 to 3 feet during winter and spring. The shrink-swell potential is moderate.

This soil is suited to and is mostly used for cultivated crops and forages. Corn, soybeans, and wheat are commonly grown. Major management concerns are controlling erosion and maintaining tilth. Terraces, no-tillage systems, and cropping systems that include small grains, grass-legume meadows, or both of these help to reduce soil erosion. No-tillage systems are effective in areas where terraces are not practical because of uneven slopes. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Conservation tillage that leaves large amounts of residue on the soil along with subsoiling and chiseling helps to keep the soil in a favorable condition.

This soil is suited to grasses and legumes. Red clover is better suited than alfalfa because of the wetness associated with the moderately slow permeability in the subsoil. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition.

Areas of this soil are suited to trees. Some areas remain in native hardwoods. A few trees are along fence rows or in drainageways. Woodlots need protection from grazing and trampling by livestock. This soil does not have hazards or limitations in the planting, growing, or harvesting of trees.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Construction that provides adequate reinforcement of footings, foundations, and basement walls helps to overcome the shrinking and swelling in this soil. The sealing of basements and drainage of excess water are needed because of the seasonal high water table. Properly constructed sewage lagoons or mound systems for absorption fields are adequate for waste disposal. Slope and wetness are limitations for lagoons, but lagoon sites generally can be leveled. Sealing the bottom of lagoons with a slowly permeable material helps to prevent contamination of the ground water.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

21C—Nicholson silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on upland ridgetops and side slopes. Areas are irregular in shape and range from 40 to 200 acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil to a depth of about 25 inches is yellowish brown silt loam and dark yellowish brown, mottled silty clay loam. Below this is a fragipan of yellowish brown, mottled, brittle silt loam about 26 inches thick. The lower part of the subsoil to a depth of 68 inches or more is yellowish brown, mottled, very firm silty clay.

Included with this soil in mapping are areas of Fourche soils and small areas of Crider and Gerald soils. The Fourche soils are deep and moderately well drained and do not have a fragipan. They are on positions similar to those of this Nicholson soil. The Crider soils are deep and well drained, have a red clayey subsoil, and are on convex ridges. The Gerald soils are somewhat poorly drained, have a clayey subsoil, and are on flatter ridgetops. The included soils make up about 10 to 15 percent of mapped areas.

The permeability is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is medium, and available water capacity is low to moderate. Reaction of the subsoil ranges from medium acid to very strongly acid. The surface layer is friable and is easily tilled. The natural fertility and the organic matter content are low. The effective rooting depth ranges from about 25 to 40 inches. A perched water table is above the fragipan at a depth of 1 1/2 to 2 1/2 feet late in winter and during spring. The shrink-swell potential is moderate.

Some areas of this soil are in row crops. Corn, soybeans, and grain sorghum are suited. However, plant roots are not able to penetrate deeply into the soil because of the fragipan. Moisture deficiencies are common late in summer. Additional soil management concerns are controlling erosion and maintaining fertility. The combination of a silt loam surface layer and the slowly permeable subsoil make this soil very erodible. Erosion damage reduces the effective rooting depth. No-tillage systems that leave plant residue on the surface tend to keep this soil from drying out in spring and to delay early planting. Early planting is needed to avoid the droughtiness late in summer. In most areas, cropping systems that include small grains, grass-legume meadows, or both of these help to control erosion. Regular applications of most soil amendments are needed to produce high yields.

Most areas are used for hay and pasture. The fragipan causes this soil to be wet in spring and to be dry late in summer. Grazing when the soil is wet and overgrazing cause compaction and loss of stand and result in a lower carrying capacity of the pasture. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition. Soil amendments are needed to produce high yields.

Areas of this soil are suited to trees. A mixture of hardwoods remains in some areas as woodlots and along fence rows or in drainageways. Equipment limitations occur during the period when the upper part of the soil is saturated. Skidding, loading, and hauling logs after excess moisture is gone from the soil help to reduce rutting and miring. Woodlots need protection from grazing.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Wetness, shrink-swell potential, and slope are the major concerns. Adequate drainage of excess water from around foundations and basements is needed because of the seasonal high water table. Proper reinforcement in footings and foundations helps to prevent damage caused by shrinking and swelling of this soil. The slow permeability in the fragipan is a limitation for conventional septic tank absorption fields. Sewage lagoons or mound systems for absorption fields are adequate for onsite waste disposal. Sites for sewage lagoons need to be leveled by grading. Sealing the bottom of lagoons with a slowly permeable material helps prevent contamination of the ground water.

This soil is in land capability classification IIe. The woodland ordination symbol is 3o.

22E—Wilderness cherty silt loam, 14 to 30 percent slopes. This deep, moderately well drained soil is on convex ridges. The ridges are long and narrow and commonly range from about 250 to 500 feet in width. Areas range from about 30 to 400 acres.

Typically, the surface layer is dark brown cherty silt loam about 6 inches thick. The subsurface layer is brown cherty silt loam about 6 inches thick. The subsoil above the fragipan is about 15 inches thick. The upper part is strong brown cherty clay loam, and the lower part is yellowish red very cherty clay loam. Below this to a depth of 60 inches or more is a mottled, brittle fragipan. The fragipan is light yellowish brown very cherty loam in the upper part, reddish yellow cherty silt loam in the middle part, and strong brown cherty clay loam in the lower part. In areas, the upper part of the subsoil contains less than 15 percent chert. In many small areas on the steeper slopes, the soil is not so gray and the fragipan is thinner and is penetrated by roots. In several areas on ridgetops, slopes are less than 14 percent.

Included with this soil in mapping are areas smaller than 8 acres of Hildebrecht or Union soils. These soils contain less chert above the fragipan and are on the wider ridges. Goss soils are on steeper positions along the drainageways. They have a red cherty clay subsoil and do not have a fragipan. Also included are a few areas of soils that have slopes of as much as 55 percent. The included soils make up about 10 to 15 percent of mapped areas.

The permeability is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is medium or rapid, and available water capacity is low. Reaction is strongly acid to slightly acid in the surface layer, strongly acid or very strongly acid in the subsoil, and very strongly acid or extremely acid in the fragipan. The surface layer contains chert and is difficult to till. The natural fertility is low, and the organic matter content is moderately low. Effective rooting depth is restricted by the fragipan at a depth of about 24 to 29 inches. Late in winter and during spring a perched water table is above the fragipan at a depth of 1 foot to 2 feet. The shrink-swell potential is moderate in the lower part of the fragipan.

This soil is suited to grasses and legumes. A few areas have been cleared and are used for pasture. The main pasture management concerns are controlling erosion, maintaining fertility, and preventing overgrazing. Pasture in good condition effectively reduces erosion. Areas in which the surface layer contains less chert and the slopes are gentle are favorable for pasture establishment and management. Brush and weed control may be a continuing concern where chert is on the surface. In some areas seedbed preparation can be done by controlled burning; in other areas girdling, cutting, or herbicides may be required. Both native and cool-season grasses are suited. Lespedeza in pasture is good for extending the grazing season. Some areas have limited native grasses and forbs for grazing. Proper stocking rates and pasture rotation help prevent overgrazing. These practices in combination with adequate fertilizer applications help to keep forage in good condition, reduce competition from weedy species, and control erosion.

This soil is suited to trees. Most areas are in woodland and have low quality hardwoods that result from poor harvesting practices, wildfire, and grazing. Many areas are in shortleaf pine and mixed hardwoods. The erosion hazard, equipment limitations, seedling mortality, and windthrow hazard are management concerns. Management practices that favor natural reproduction of species are desirable. Roads and skid trails should be on the contour. In some areas, logs need to be yarded uphill to skid trails and roads. Some disturbed areas need reseeding after harvesting is completed. Planting larger size stock and favoring north- and east-facing slopes increase seedling survival. Harvesting of mature trees and lighter, more frequent thinning help reduce windthrow. Woodlands need protection from grazing and fire.

Woodland wildlife habitat can be improved by providing food and cover. Brushy thickets can be established by clearing small areas in large areas of mature woodland. Food plots or green browse areas can be planted along logging roads and trails. Areas that produce native plants can be improved by disking and fertilizing.

This soil generally is not suitable for building site development because of steep slopes.

This soil is in land capability classification VIs. The woodland ordination symbol is 4d.

23B—Gerald silt loam, 1 to 4 percent slopes. This deep, very gently sloping and gently sloping, somewhat poorly drained soil is on moderately wide upland divides. Areas are oblong and are 10 to 200 acres. They are on ridgetops in a pattern along major drainage divides.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil above the fragipan is about 16 inches thick. It is dark grayish brown, mottled silty clay in the upper part, dark gray, mottled clay in the middle part, and dark yellowish brown, mottled, firm silty clay loam in the lower part. The next 24 inches of the subsoil is a yellowish brown, mottled, brittle, silt loam fragipan. The lower part of the subsoil to a depth of 60 inches or more is yellowish brown, mottled, very firm clay. In areas, the subsoil does not have reddish mottles. In a few eroded areas, the plow layer is silty clay loam.

The permeability of this soil is very slow, runoff is slow, and available water capacity is low. Reaction of the surface layer is variable, depending on liming practices, and the subsoil commonly is strongly acid or very strongly acid. The surface layer is friable and is easily tilled. The natural fertility is low, and the organic matter content is moderately low. The effective rooting is restricted at a depth of about 20 to 30 inches by the fragipan. Late in winter and during spring a water table is above the fragipan at a depth of 1 foot to 2 feet. The shrink-swell potential is high in the clayey subsoil.

Most areas of this soil have been cleared and are used for forage crops or cultivated crops. Only a few areas of trees remain as small woodlots or along fence rows.

Areas of this soil are suited to corn, soybeans, and grain sorghum. Because of the fragipan, plant roots are restricted and shortages of soil moisture for grain crops are common late in summer. Controlling erosion and maintaining fertility are soil management concerns. The combination of a silt loam surface layer and a slowly permeable subsoil makes this soil very erodible. Any erosion damage reduces effective rooting depth. Terraces are not a favorable practice on this soil because of the fragipan. Reduced rooting depth causes problems for vegetating the channel after construction of terraces. No-tillage systems for spring crops are difficult to use on this soil because of the wetness during spring planting. Also, they leave residue on the surface that delays planting. Optimum plantings are needed to avoid the dryness late in summer. Cropping systems that include small grains, grass-legume meadows, or both of these are effective in helping to control erosion. Keeping tillage to a minimum, subsoiling or chiseling, and maintaining organic matter content help to keep the soil in good tilth. Regular applications of soil amendments are needed to produce high yields.

Deep-rooted legumes, such as alfalfa, commonly do not produce well on this soil because of limited rooting depth and susceptibility to frost heaving. The fragipan causes this soil to be wet in spring and dry late in summer. Grazing when this soil is wet and overgrazing cause compaction and loss of stand. This increases the hazard of erosion and results in a lower carrying capacity of the pasture. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suitable for building site development and for onsite waste disposal systems if proper design and installation procedures are used. Construction that assures adequate strength of footings, foundations, and basement walls is needed to help overcome the shrink-swell potential in the subsoil, and drainage of excess water is needed because of the seasonal high water table. Wetness and very slow permeability in the fragipan are severe limitations. Because of these limitations, this soil generally is not suitable for conventional septic tank absorption fields. Other systems, such as sewage lagoons or mound systems for absorption fields, are adequate for treatment of waste.

This soil is in land capability classification IIw. A woodland ordination symbol is not assigned to this soil.

25A—Auxvasse silt loam, 0 to 3 percent slopes. This deep, nearly level, poorly drained soil is on low stream terraces. Flooding is rare. Areas are oval or oblong and range from 10 to about 200 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsurface layer is light brownish gray silt loam about 7 inches thick. Next is about 3 inches of brown silty clay loam mixed with light brownish gray silt loam from the subsurface layer. The subsoil is about 28 inches thick. The upper part is grayish brown, mottled, very firm silty clay, and the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of 72 inches or more is grayish brown, mottled silty clay loam and stratified grayish brown very fine sandy loam. In some areas, the upper part of the subsoil is silty clay loam. In some areas, the clayey subsoil extends to a depth of 4 to 5 feet.

Included with this soil in mapping are small areas of well drained Ashton soils and somewhat poorly drained Freeburg soils. The Ashton soils are browner, less clayey, and more permeable than this Auxvasse soil. They are on lower terrace positions that separate the Auxvasse soils from the primary flood plain. The Freeburg soils are on the higher terraces. They are intermingled with this Auxvasse soil near the higher elevation where these terraces join the lower terraces. The included soils make up about 5 to 10 percent of mapped areas.

The permeability of this soil is very slow, surface runoff is slow, and available water capacity is high. Reaction in the surface layer is slightly acid, or is neutral if the surface layer has been limed. It commonly is medium acid to very strongly acid in the subsoil. The surface layer is friable and is easily tilled, but it puddles if worked when wet. The natural fertility is low, and the organic matter content is low. The clayey subsoil restricts rooting depth for some crops, especially summer annuals. During winter and early in spring, a perched water table is at a depth of 1 foot to 2 feet. The shrink-swell potential is high in the clayey subsoil.

Most areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, grain sorghum, and wheat. If this soil is used for cultivated crops, excess wetness and poor surface drainage are hazards in many areas. They hinder the planting and harvesting of crops, especially in extremely wet years. Artificial drainage, such as drainage tile, surface ditches, and diversions, helps to remove the excess wetness. Diversions also help to prevent erosion caused by upland runoff in some areas. Keeping tillage to a minimum, subsoiling or chiseling, and maintaining organic matter content help to keep the soil in good tilth.

This soil is suited to grasses and legumes for hay and pasture. A few areas are used for hay and pasture. Because of frost heaving action in winter, some winterkill is likely in forage crops that have a large taproot. Controlled grazing, timely deferment of grazing, surface drainage, and the selection of plants that have a fibrous root system help to keep winterkill at a minimum.

All areas of this soil have been essentially cleared and are not used for woodland.

This soil is suited to wetland wildlife habitat. Dug-out ponds or low dikes assist in supplying an ample amount of water for production of fish or attracting waterfowl.

This soil has limitations for building site development and sanitary facilities. Wetness, possible flooding on some sites, and high shrink-swell potential in the subsoil are main limitations. Onsite investigations and a knowledge of previous flooding are needed for development. Some sites generally are suitable. Also, dwellings can be constructed on raised, well compacted fill material. Surface drainage by diverting the surface water or installing underground drainage tile helps to eliminate the wetness. Adequate reinforcement of footings and foundations is necessary to overcome the shrinking and swelling of this soil. Septic tank absorption fields are not suited because of the very slow permeability. Sewage lagoons function adequately, but berms should be high enough to prevent overtopping from flooding.

This soil is in land capability classification IIIw. The woodland ordination symbol is 4w.

34C—Weingarten silt loam, 3 to 9 percent slopes. This deep, moderately sloping, well drained soil is on upland ridgetops (fig. 12). Areas are narrow or irregular in shape. They are along the common pattern of the ridges. They range from about 40 acres to 400 acres or more.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of about 35 inches is yellowish brown silt loam in the upper part and dark yellowish brown silty clay loam in the lower part. Next is about 16 inches of partially brittle, yellowish brown silt loam. The subsoil is strong brown cherty clay. In some eroded areas, the plow layer is mixed silt loam and silty clay loam.

Included with this soil in mapping are small areas of Hildebrecht soils and areas of soils in which red cherty clay is at a depth of 20 to 30 inches. The Hildebrecht soils have a fragipan. The included soils are on positions similar to those of this Weingarten soils. They make up 10 to 15 percent of mapped areas.

The permeability of this soil is moderately slow, runoff is medium, and available water capacity is commonly high. Reaction in the subsoil ranges from slightly acid to very strongly acid. The surface layer is friable and is easily tilled. The natural fertility is medium, and the organic matter content is moderately low. Rooting depth is moderately restricted at a depth of about 35 inches. The shrink-swell potential is moderate.

A small acreage of this soil is used for cultivated crops. Corn, wheat, and soybeans are suited. Major soil management concerns are controlling erosion and maintaining good tilth and fertility. In most areas, cropping systems that include small grains, grass-legume meadows, or both of these and no-tillage systems help to reduce erosion. Terraces are suited to some sites, but deep cutting can expose excessive amounts of chert in some areas. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter in the surface layer help to keep this soil in good tilth. Moderate amounts of fertilizer are needed to maintain high yields.

Most areas of this soil are used for pasture and hay. They are suited to grasses and most legumes. This soil is moderately suited to alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition.

This soil is suited to trees, and some areas remain in native hardwoods. This soil does not have hazards or limitations in the planting or harvesting of trees. Forested areas should be protected from grazing and wildfire.

This soil is suitable for building site development and onsite waste disposal systems. The moderate shrink-swell potential can be overcome by providing adequate reinforcement steel in footings, foundations, and basement walls. Septic tank absorption fields function properly if the size of the field is larger than standard. Sewage lagoons are suitable on most sites if the site is

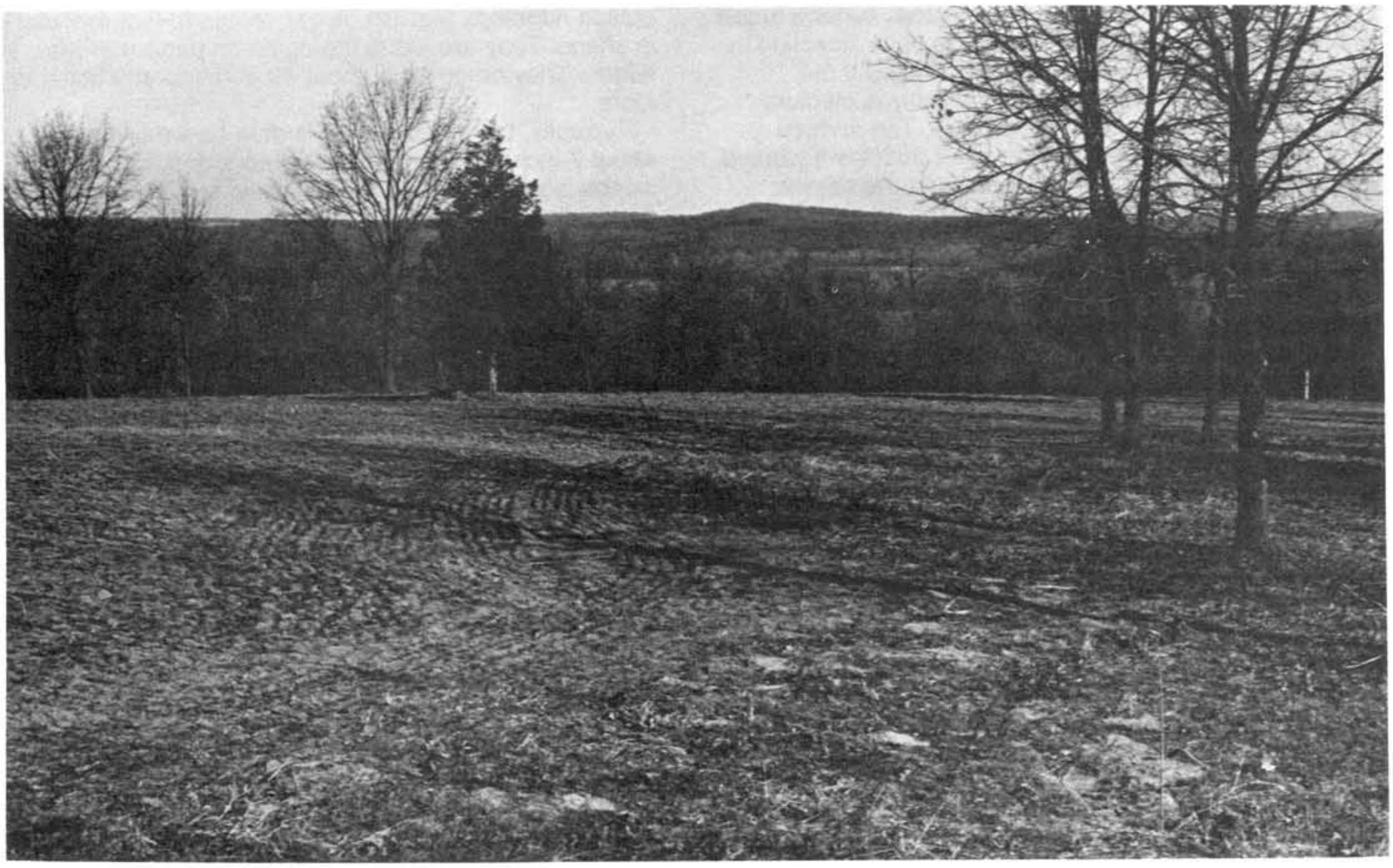

Figure 12.—Typical setting of Weingarten silt loam, 3 to 9 percent slopes, on a ridgetop. Goss soils are on the steeper slopes in the background. A newly seeded fescue pasture is in the foreground.

leveled and the bottom of the lagoon is sealed with slowly permeable material to prevent seepage.

This soil is in land capability classification IIIe. The woodland ordination symbol is 3o.

34D—Weingarten silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on upland ridgetops and side slopes. Areas are 250 to 1,300 feet wide and are along the irregular pattern of drainage divides. They range from 100 to nearly 1,000 acres.

Typically, the surface layer is dark brown silt loam 7 inches thick. The subsoil to a depth of about 35 inches is yellowish brown silt loam in the upper part, yellowish brown silty clay loam in the middle part, and dark yellowish brown silt loam in the lower part. Next is about 16 inches of partially brittle, brown silt loam. The lower part of the subsoil is reddish brown cherty clay to a depth of 72 inches or more. In some areas, the cherty clay is at a depth of less than 40 inches. In some eroded, gullied areas, the surface layer is yellowish brown silty clay loam.

Included with this soil in mapping are small areas of Goss and Hildebrecht soils. The Goss soils are lower on the side slopes than this Weingarten soil and are cherty throughout. The Hildebrecht soils are on positions similar to this Weingarten soil. They have a fragipan. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderately slow, runoff is medium, and available water capacity commonly is high but ranges to moderate in eroded areas. Reaction of the subsoil ranges from slightly acid to very strongly acid. The surface layer is friable and is easily tilled. The natural fertility is medium, and organic matter content is moderately low. Rooting depth is moderately restricted at a depth of about 35 inches. Although this soil has some internal wetness, the water table is below a depth of 60 inches. The shrink-swell potential is moderate.

Some areas of this soil are used for cultivated crops. This soil is suited to corn and wheat. Effectively controlling erosion and keeping the soil in good tilth are major soil management concerns. Terraces and crop rotations are needed to help control erosion in most areas. No-tillage systems help to increase the number of years that grain crops can be kept in a rotation. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Conservation tillage, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth. Moderate amounts of fertilizer are needed to maintain high yields.

Most areas are used for forage. This soil is suited to grasses and most legumes. It is moderately suited to alfalfa. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility help to keep the pasture in good condition.

Areas of this soil are suited to trees, and some areas remain in native hardwoods. This soil does not have hazards or limitations in the planting or harvesting of trees. Forested areas should be protected from grazing and wildfire.

This soil is suitable for building site development and for onsite waste disposal systems. Landshaping and leveling are necessary in most areas for dwellings, sewage lagoons, and septic tank absorption fields, or dwellings and absorption fields should be designed to conform to the natural slope. Footings, foundations, and basement walls need to be reinforced with steel to withstand the shrink-swell potential of this soil. Careful onsite inspections of the site should be made to determine the size of the septic tank absorption field needed. If the red cherty clay is exposed during construction, sealing the bottom of the sewage lagoon with slowly permeable material helps to prevent seepage.

This soil is in land capability classification IVe. The woodland ordination symbol is 3o.

39D—Lily loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, well drained soil is on upland side slopes. Areas are irregular in shape and range from 40 to 400 acres.

Typically, the surface layer is dark brown loam about 4 inches thick. The subsurface layer is yellowish brown loam about 4 inches thick. The subsoil is about 23 inches thick. The upper part is brown, friable loam, and the lower part is strong brown, very firm clay loam. Hard sandstone bedrock is at a depth of about 31 inches.

Included with this soil in mapping are small areas of Jonca, Lamotte, and Ramsey soils. The Jonca soils are higher on the side slopes than this Lily soil, are more than 40 inches deep, and have a fragipan. The Lamotte soils are on positions similar to those of this Lily soil and are more than 40 inches deep. The Ramsey soils are lower on side slopes and are less than 20 inches to bedrock.

The permeability of this soil is moderately rapid, runoff is rapid, and available water capacity is low. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to extremely acid in the subsoil. The surface layer is friable and is easily tilled. The organic matter content is moderately low, and the natural fertility is low. Rooting depth is restricted to a depth of about 31 inches.

This soil is suited to cultivated crops if erosion control measures are intensive. Cropping systems that include grass or legume meadow in about 4 out of 5 years in rotation are needed to reduce erosion. If no-tillage systems are used, the number of years grain crops are in the rotation can be increased. Terraces are not favorable practices because of depth to rock and slopes. Soil amendments are needed to produce high yields.

This soil is suited to grasses and legumes. Some areas are used for forage crops. Pasture in good condition effectively helps to control erosion. Preventing overgrazing and maintaining fertility keep the pasture in good condition. This soil is droughty late in summer and early in fall. Cool-season grasses are suited because most of their growth occurs when moisture is not a limiting factor.

Areas of this soil are suited to trees. Most areas remain in shortleaf pine and mixed hardwoods. This soil does not have limitations in the planting or harvesting of trees. Forested areas need protection from grazing and wildfire.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing dens, openings, and food plots.

This soil is suited to extensive recreational uses. Limitations for camp areas and picnic areas are moderate because of slopes. Some landshaping and leveling are necessary for campsites, picnic areas, and parking areas. Roads should be located across the slope where possible.

This soil generally is not suitable for building site development and for onsite waste disposal systems because of the depth to rock and the slopes.

This soil is in land capability classification IVe. The woodland ordination symbol is 4o.

40E—Ramsey stony loam, 14 to 35 percent slopes. This shallow, steep, somewhat excessively drained soil is on upland side slopes and escarpments above draws and small streams. Stones, small outcrops of sandstone, and steep bluffs and ledges 40 to 80 feet in height are common and cover about 15 percent of the surface (fig. 13). Areas range from 10 to 600 acres.

Typically, the surface layer is very dark grayish brown stony loam about 3 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil to a depth

Figure 13.—A shortleaf pine tree growing on the shallow Ramsey stony loam, 14 to 35 percent slopes.

of about 15 inches is yellowish brown loam. Below this is hard sandstone bedrock.

Included with this soil in mapping are small areas of moderately deep Lily soils and outcrops of rock. The Lily soils are on the higher positions and on the foot slopes. The outcrops of rock commonly are lower on the side slopes. The included soils and rock outcrop make up 10 to 15 percent of mapped areas.

The permeability of this soil is rapid, surface runoff is rapid, and available water capacity is very low. Reaction commonly is very strongly acid or strongly acid throughout the profile, but the surface layer ranges to slightly acid where mixed hardwoods are dominant. The surface layer is stony. The natural fertility is low, and the organic matter content is moderately low. Rooting depth is restricted to a depth of less than 20 inches except for occasional fractures in the bedrock.

This soil generally is not suited to cultivated crops. Major limitations are droughtiness, stoniness, shallow depth, and steepness of slope. This soil is better suited to limited pasture, woodland, wildlife, and recreation than to most other uses.

A few areas that have slopes of less than 20 percent and have fewer stones on the surface are used for pasture. Major concerns are maintaining sufficient cover to reduce erosion and controlling weeds. Pasture requires very restricted and controlled grazing. Native grasses, fescue, and lespedeza are common species.

This soil is suited to trees, and most areas are in woodland. Native hardwoods and shortleaf pine are the main species. The erosion hazard, equipment limitation, seedling mortality, and windthrow hazard are major management concerns. Erosion in woodland is caused by logging roads and trails. Careful layout of roads and trails on the contour and seeding after harvesting help to reduce the hazard of erosion. In many areas, the yarding of logs uphill to skid trails and roads is required. Seedling mortality is moderate because of the shallow, droughty soil. The effect of droughtiness can be partially overcome by planting larger than usual stock on north- and east-facing slopes. Windthrow is a concern, especially where only a few mature trees remain after harvesting. Harvesting mature trees and thinning for reduction of stand density reduce windthrow damage. Management is needed to assure continued pine reproduction. Tree species to plant are shortleaf pine and northern red oak. Woodland should be protected from grazing and wildfire.

Deer, turkey, and squirrels are the main woodland wildlife species. Habitat can be improved by establishing more diversity of cover, or more food plots, or both of these. Small openings, seeded log roads, brushy thickets, and adjacent areas can provide more diversity. Areas suitable for food plots are commonly on adjacent ridgetops, on some foot slopes, and along small stream bottoms.

Some areas of this soil are suitable for recreational uses. Many areas occupy canyonlike gorges along small drainageways. Sandstone bluffs, scenic overlooks, and small waterfalls are common. Trails need to be carefully designed and constructed to help prevent erosion and to increase the ease of travel.

This soil generally is not suitable for building sites and onsite waste disposal systems because of the shallow depth to bedrock.

This soil is in land capability classification VIIs. The woodland ordination symbol is 5x.

41E—Gasconade stony silty clay loam, 9 to 35 percent slopes. This shallow, strongly sloping to steep, somewhat excessively drained soil is on uplands along the lower part of the side slopes. Areas, called "glades" or "cedar glades," are irregular in shape. They range from 8 to several hundred acres (fig. 14). Limestone, 15

Figure 14.—A sparse canopy of eastern redcedar and openings of native warm-season grasses are typical of the Gasconade soils. In the foreground is Ross silt loam on a small creek bottom.

to 24 inches long, and outcrops of rock commonly cover 8 to 10 percent of the surface.

Typically, the surface layer is very dark gray stony silty clay loam about 8 inches thick. The subsoil is very dark grayish brown flaggy silty clay loam about 4 inches thick. Hard, white limestone is at a depth of 14 inches. It has cracks and crevices filled with dark brown silty clay loam. In some areas, the surface layer and subsoil are silt loam.

Included with this soil in mapping are areas of moderately deep Caneyville soils and deep Crider soils. These soils are on isolated foot slopes and commonly are less than 4 acres. Also included are outcrops of rock consisting of ledges that form narrow steplike bands around the slope. The included soils and outcrops make up about 5 percent of mapped areas.

The permeability of this soil is moderately slow, runoff is rapid, and available water capacity is very low. Reaction ranges from mildly alkaline to slightly acid throughout. The surface layer in most areas is not tillable because of stones and shallow depth to rock. The natural fertility and the organic matter content are moderate. Rooting is restricted by bedrock at a depth of about 14 inches. The shrink-swell potential is moderate.

Most areas of this soil are in unimproved woodland or range. The vegetation consists of sparse trees and native grasses. The main tree species are eastern redcedar and low quality hardwoods. This soil is suited to pasture, woodland, wildlife habitat, and recreational uses.

Where areas of this soil are used for pasture, the main management concerns are maintaining adequate cover to reduce erosion and controlling weedy species. Because of slope and depth to rock, this soil is very susceptible to damage from erosion and the grass cover is subject to deterioration. Most areas produce native grasses, such as big bluestem, indiangrass, and sideoats grama. Controlled grazing is needed to manage these grasses. Other species to plant are tall fescue and common lespedeza. Seedbed preparation and brush

control are difficult because of the rough, stony surface and steep slopes.

This Gasconade soil generally is not suited to commercial forest. Most areas support native grasses, eastern redcedar, upland oaks, and ash. The trees are utilized as fenceposts and firewood. Growing trees or grasses effectively helps to control erosion. Because of slopes, stones, and outcrops of rock, equipment limitation is severe. Seedling mortality and windthrow hazard are moderate. In many areas, seedlings cannot be planted by machine. Logging roads and trails need to be constructed on the contour. In the steepest areas logs should be yarded uphill or downhill to logging roads and skid trails. Planting larger than usual stock helps to achieve a better survival rate. Frequent, light thinnings help to prevent damage from windthrow.

Both woodland and openland wildlife inhabit areas of this soil. The areas provide seclusion to wildlife but very little food, water, or cover. This may be partially overcome by providing water sites and establishing food plots in nearby areas if they do not already exist. Brush piles and tree tops provide cover. Vegetation should be protected from fire and overgrazing.

Rugged hiking trails provide limited recreation in these unique ecological areas. Many plants and wildflowers, as well as rare species of reptiles and insects, occur only in these glades.

This soil generally is not suitable for building site development and onsite waste disposal systems because of the large stones and the shallowness to bedrock.

This soil is in land capability classification VIIs. The woodland ordination symbol is 5x.

43E—Syenite very bouldery silt loam, 14 to 35 percent slopes. This moderately deep, moderately steep and steep, well drained soil is on side slopes where igneous rocks are exposed by stream entrenchment. The rocks are 10 to about 60 inches in diameter and cover about 3 to 10 percent of the surface. The areas are about 20 acres and are oval, or they are as much as 400 acres and are long and narrow.

Typically, the surface layer is dark brown very bouldery silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 27 inches thick. The upper part is strong brown silt loam, and the lower part is brown loam and clay loam. Weathered granite is at a depth of about 36 inches, and hard red granite is at about 55 inches. In some areas, hard rock is within a depth of about 28 inches.

Included with this soil in mapping are outcrops of rock. Commonly, the outcrops are on the steeper positions and are less than 1 acre. The outcrops make up about 5 percent of mapped areas.

The permeability of this soil is moderately slow, runoff is commonly rapid, and available water capacity is low to moderate. Reaction ranges from slightly acid in the surface layer to extremely acid in the subsoil. The surface layer is friable but in most areas is not tillable because of boulders and stones on the surface. The organic matter content is moderately low, and the natural fertility is low. Rooting is restricted by the weathered granite at a depth of about 20 to 40 inches.

This soil generally is not suited to cultivated crops. Major limitations for crops are droughtiness, boulders, and steepness of slope.

A few less sloping areas of this soil are used for pasture. This soil is better suited to pasture, woodland, wildlife habitat, and recreation than to most other uses. Most areas used for pasture have slopes of less than 20 percent and have few boulders on the surface. The major management concerns are controlling erosion and maintaining fertility. Well managed stands of grasses and legumes help to reduce erosion. Moderate to high amounts of soil amendments are needed to produce high yields.

Most areas of this soil are in woodland. Native hardwoods and shortleaf pine grow well and are the main species. However, the hazard of erosion is moderate, and the equipment limitation is severe. The construction of logging roads and skid trails cause erosion. Careful layout and management of these roads and skid trails help to reduce erosion. Reseeding disturbed areas is necessary in some areas after the harvest is completed. Site management can be used to assure continued reproduction without having to plant seedlings. Equipment limitations are caused by steep slopes and boulders. Cable systems can be used for harvesting in some areas. Forest should be protected from grazing and wildfire.

Deer, turkey, and squirrels are the main woodland wildlife species. Habitat can be improved by establishing more diversity of cover, or more plots for food, or both of these. Small openings, seeded log roads, brushy thickets, and adjacent areas can provide more diversity. Areas suitable for producing food are commonly along small stream bottoms and on some foot slopes.

Areas of this soil are suitable for certain recreational uses. Many of these areas are along Pickle Creek in Hawn State Park. Footpaths and trails need to be located on the contour to reduce erosion and provide ease of travel. Selected areas are suited to camping and picnicking.

This soil is generally not suitable for building site development and waste disposal systems because of the large stones on the surface.

This soil is in land capability classification VIIe. The woodland ordination symbol is 5x.

50A—Ashton silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on low stream terraces. The terraces commonly are 15 to 20 feet in elevation above the present flood plain. Flooding

generally is rare and of brief duration, but some flooding along the lower reaches of streams is occasional and of long duration because of backwater from the Mississippi River. Areas are somewhat oval and range from 10 to about 160 acres.

Typically, the surface layer is friable silt loam about 12 inches thick. The upper part is dark brown, and the lower part is brown. The subsoil to a depth of about 58 inches is brown, friable and firm silt loam. The substratum to a depth of 72 inches or more is brown, friable silt loam.

Included with this soil in mapping are about 5 percent small areas of soils that have a sandier texture than this Ashton soil. Also included are about 10 percent escarpments and soils that commonly have short steep slopes of more than 30 percent.

The permeability of this soil is moderate, surface runoff is slow, and available water capacity is high. Reaction ranges from neutral to medium acid throughout. The surface layer is friable and is easily tilled. The organic matter content is moderate, and the natural fertility is medium.

Most areas of this soil have been cleared and are used for cultivated crops. This soil is suited to corn, wheat, and soybeans. The major soil management concern is maintaining soil tilth. Erosion can be a concern on the short steep slopes where one terrace level descends to another level. Reduced tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth.

Grasses and legumes, including alfalfa, are well suited. The grasses and legumes grown in rotation with grain crops help to reduce erosion and maintain tilth.

This soil is well suited to trees, but most areas have been cleared. Plant competition is a major concern in the planting and growing of trees for woodland or for orchards. Site preparation, tillage, mowing, and chemicals are mainly used to overcome plant competition.

This soil generally is not suitable for building site development and onsite waste disposal systems because of rare to occasional flooding. However, some areas do not have a flooding hazard and have only slight limitations or hazards for these uses. Some of these areas are in urban uses. Onsite investigations and a knowledge of previous flooding are needed to locate building sites.

This soil is in land capability classification I. The woodland ordination symbol is 1o.

52A—Freeburg silt loam, 0 to 3 percent slopes. This deep, very gently sloping, somewhat poorly drained soil is on high terraces. It is on the highest level of terraces along the lower reaches of the major tributaries of the Mississippi River. Near the Mississippi River flood plain, these terraces are as much as 50 feet above the present stream level. The very gentle slopes commonly are broken by small drainageways. Areas are somewhat oval and range from 10 to about 120 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 9 inches thick. The subsoil to a depth of about 70 inches is dark yellowish brown, mottled, silty clay loam in the upper part; yellowish brown, mottled, silty clay loam in the middle part; and dark brown, mottled silty clay loam in the lower part. Some areas near small drainageways are moderately sloping.

Included with this soil in mapping are small areas of soils that are on low positions and have short steep slopes. Also included are a few small areas on low positions that are subject to occasional flooding. The included soils make up about 5 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is slow, and available water capacity is high. Reaction is neutral or slightly acid in the surface layer and very strongly acid to neutral in the subsoil. The surface layer is friable and is easily tilled. The organic matter content is moderately low, and the natural fertility is medium. In most years, a seasonal high water table is at a depth of 1 1/2 to 3 feet late in winter and in spring. The shrink-swell potential is moderate in the subsoil.

Most areas are used for cultivated crops. This soil is suited to corn, wheat, and soybeans and to forage crops. The major soil management concern is keeping the soil in good tilth. Erosion can be a hazard on the more sloping areas unless permanent cover is maintained. Reduced tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth.

Grasses and legumes, including alfalfa, grow well. Including grasses and legumes in rotation with grain crops helps to reduce erosion and maintain tilth.

Areas of this soil are suited to trees, but most areas have been cleared. This soil does not have hazards or limitations in the planting, growing, and harvesting of trees. Woodlots should be protected from grazing.

This soil is suitable for building site development and onsite waste disposal systems. Shrink-swell potential and wetness are limitations for dwellings. Adequate reinforcements and drainage help prevent damage to basements, foundations, and footings. Installing tile drains around footings and foundations helps prevent damage caused by excessive wetness. Sealing the bottom of sewage lagoons helps prevent contamination of the ground water.

This soil is in land capability classification IIw. The woodland ordination symbol is 3o.

64—Carr fine sandy loam. This deep, gently undulating, well drained soil is on the Mississippi River flood plain. These soils are subject to occasional flooding unless protected by a levee. Areas are

elongated, narrow bands or oval-shaped ridges ranging from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown fine sandy loam about 9 inches thick. The substratum in the upper 7 inches is grayish brown fine sand. Beneath this to a depth of about 60 inches, is dark grayish brown very fine sandy loam and grayish brown loamy very fine sand. In some areas, the surface layer is very fine sandy loam or silt loam.

Included with this soil in mapping along tributaries of the Mississippi River are long narrow areas of soils that have coarser sand and do not have free carbonates. These included soils make up about 15 percent of mapped areas.

The permeability of this soil is moderately rapid, surface runoff is slow, and available water capacity is moderate. Reaction is mildly alkaline or moderately alkaline throughout. The surface layer is friable and is easily tilled. The natural fertility is high, and the organic matter content is low.

Most areas are used for cultivated crops. They are suited to sprinkler irrigation systems, where protected from flooding. This soil is suited to corn, soybeans, small grain, and forage crops. Soil conditions are favorable for double cropping. Keeping the soil in good physical condition is a concern in soil management. This soil tends to form traffic pans or plowpans if it is tilled when too wet. Keeping cultivation to a minimum, subsoiling or chiseling, and maintaining organic matter content in the surface layer keep the soil in good physical condition. The fertility program is centered around the use of nitrogen for all nonlegume crops.

Areas of this soil are suited to trees. This soil does not have major concerns in the planting, growing, and harvesting of trees. Planting and harvesting can be scheduled during summer and fall when the chance of flooding is low. Woodlots should be protected from grazing and wildfire.

Although levees are provided for crop protection in some areas, this soil generally is not suitable for building site development because of the occasional flooding.

This soil is in land capability classification IIs. The woodland ordination symbol is 3o.

65—Ross silt loam. This deep, nearly level, well drained soil is on flood plains of creeks and rivers. Areas are along streams and are subject to frequent flooding for brief periods during winter and spring. Most areas are a few hundred acres, range from 250 to 600 feet in width, and commonly are several miles in length.

Typically, the surface layer is dark brown, very friable silt loam about 10 inches thick. The subsoil is very dark grayish brown, friable silt loam about 20 inches thick. The substratum to a depth of 66 inches or more is dark brown and dark grayish brown, friable silt loam.

Included with this soil in mapping are small areas of soils that have a dark brown surface layer less than 20 inches thick and are underlain by sand or gravel. These soils form a narrow strip bordering the stream channel and are in sycamore-cottonwood forest. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is slow, and available water capacity is high. Reaction ranges from slightly acid to neutral throughout. The surface layer is friable and is easily tilled through a wide range of soil moisture. The organic matter content is moderate to high, and the natural fertility is high. Rooting depth is favorable. The water table is below a depth of 4 feet.

Most areas are used for cultivated crops. This soil is suited to corn, soybeans, and a variety of cultivated crops. The flooding hazard generally is early in spring or late in winter and is of short duration. Because of the time and length of flooding, it generally does not interfere with farming operations and does not damage the crop. Soil management concerns are keeping the soil in good tilth and providing protection from flooding. Plowpans or traffic pans seldom form in cultivated fields, unless this soil is tilled when too wet. Keeping tillage at a minimum and maintaining organic matter content in the surface layer help to keep the soil in good tilth. Diversion terraces are needed in some areas to protect fields from upland runoff. Small levees provide protection in some areas for farming. Most streams that are adjacent to areas of this soil contain gravel, and floodwater deposits large amounts of gravel on fields. Keeping the stream channel free of obstructions reduces damaging overflow. Trees and brush along the stream channels slow floodwater and help stabilize the channel. Only small to moderate amounts of some soil amendments are needed to maintain high yields. The amount depends on the crop grown.

In some areas, this soil is used for forage crops. It is suited to grasses and legumes. Pasture in good condition helps to keep the soil in good tilth. Grazing when the soil is too wet or during flooding causes compaction and deterioration of pasture. Deferred grazing, proper stocking rates, and pasture rotation help to maintain soil tilth and pasture condition.

A small acreage of this soil is forested. This soil is suited to trees. Plant competition for seedlings is a major concern and can be overcome by proper site preparation. Planting and harvesting should be scheduled during summer and fall when the chance of flooding is low. Forested areas need protection from grazing and wildfire.

This soil generally is not suitable for building site development and onsite waste disposal systems because of the frequent flooding.

This soil is in land capability classification IIw. The woodland ordination symbol is 1o.

66—Haymond silt loam. This deep, nearly level, well drained soil is on flood plains of small creeks and rivers.

It is subject to frequent flooding for brief periods. Areas are long and narrow and are along stream patterns. They commonly are several hundred acres.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. Next is a transitional layer that is weakly stratified, dark brown, friable silt loam about 14 inches thick. The underlying material to a depth of about 72 inches is very friable and friable silt loam. It is yellowish brown and dark brown in the upper part and brown in the lower part. In a few areas, the surface layer is very dark grayish brown. In some areas, the underlying material is more than 15 percent gravel.

Included with this soil in mapping are narrow strips of somewhat excessively drained, gravelly Midco soils. These soils border the stream channel at a lower elevation than this Haymond soil. They are flooded frequently and commonly are forested. The included soils make up about 10 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is very slow, and available water capacity is high. Reaction is neutral or mildly alkaline throughout. The surface layer is friable and is easily tilled through a wide range of soil moisture. The organic matter content is moderate, and the natural fertility is high. Rooting depth is favorable.

Most areas are used for cultivated crops. This soil is suited to corn, soybeans, and other common cultivated crops. Soil management concerns are maintaining soil tilth and controlling flooding. Plowpans or traffic pans form readily where cropland is cultivated by conventional tillage, especially where the organic matter content is low. Keeping tillage at a minimum, subsoiling or chiseling, and maintaining organic matter content in the surface layer help to keep the soil in good tilth. Flooding is frequent. It generally is late in winter or early in spring, and is of short duration. The flooding generally does not interfere with farming operations and does not damage crops. Some areas are subject to backwater flooding from the Mississippi River. A few areas are damaged by erosion caused by runoff from adjacent uplands. Diversion terraces are needed to protect these areas. Floodwater occasionally deposits gravel on fields. Trees and brush along the streambank help to reduce the deposition of gravel by slowing the floodwater and stabilizing the channel.

Some areas of this soil are used for forage crops. This soil is suited to grasses and legumes for pasture and hay. Grasses and legumes grown in rotation with cultivated crops help maintain tilth. Grazing when this soil is too wet or during the flooding season causes compaction and deteriorates pasture. Deferred grazing, proper stocking rates, and pasture rotation help to maintain soil tilth and pasture.

A few areas of this soil remain in woodland. This soil is suited to trees. Plant competition for seedlings is a major concern. This can be overcome by planting special stock of a larger size than usual or planting container grown stock. Proper site preparation and maintenance by mowing, tillage, or chemicals are necessary in some areas to eliminate competition. Planting and harvesting should be scheduled during summer and fall when the chance of flooding is low. Forested areas need protection from grazing and wildfire.

This soil generally is not suitable for building site development and onsite waste disposal systems because of frequent flooding.

This soil is in land capability classification IIw. The woodland ordination symbol is 1o.

67—Wilbur silt loam. This deep, nearly level, moderately well drained soil is on flood plains of creeks and rivers. The flood plains are commonly on the lower reaches of streams bordering the Mississippi River flood plain. This soil is subject to frequent flooding or backwater from the Mississippi River. Areas are 250 to 600 feet wide and are along the stream pattern. Commonly the areas are large but range from 20 to about 400 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. Next is a brown silt loam transitional layer to a depth of 18 inches. The underlying material to a depth of about 60 inches is silt loam. It is brown with grayish brown mottles in the upper part, brown and grayish brown with dark brown mottles in the middle part, and gray with dark brown mottles in the lower part. In some areas, the substratum below a depth of 40 inches is stratified with silty clay loam.

The permeability of this soil is moderate, surface runoff is slow, and available water capacity is high. Reaction is slightly acid to mildly alkaline throughout. The surface layer is friable and is easily tilled through a wide range of soil moisture. The organic matter content is moderate, and the natural fertility is high. Effective rooting depth is about 40 inches. A seasonal high water table is at a depth between 1 1/2 and 3 feet during spring.

Most areas have been cleared and are used for cultivated crops. This soil is suited to corn, soybeans, and a variety of common cultivated crops. Flooding generally is early in spring or late in winter and is of short duration. The flooding generally does not interfere with farming operations and does not damage the crops. Some areas are subject to backwater flooding of long duration from the Mississippi River. Soil management concerns are keeping the soil in good physical condition and providing protection from flooding. Plowpans or traffic pans form readily in cultivated fields, especially if the organic matter content is low. Reduced tillage operations, subsoiling or chiseling, and maintaining organic matter in the surface layer help to keep the soil in good tilth. In some areas, diversion terraces are needed to protect fields from runoff from adjacent uplands. Small levees provide flood protection in some areas for farming. A few small areas need surface

drainage. This may be done by shallow ditches where outlets are available. Trees and brush along the stream channels slow floodwater and help stabilize the channel. Only small to moderate amounts of soil amendments are needed to maintain high yields, depending on the crop grown.

Small areas of this soil are used for forage crops. This soil is suited to grasses and legumes. Pasture in good condition helps to keep the soil in good physical condition. Grazing should be restricted or deferred during flooding and wet periods to avoid compaction of the soil and deterioration of the pasture.

A few areas of this soil remain in woodland. This soil is suited to trees. Plant competition for seedlings is a major concern. Proper site preparation, including prescribed burning, spraying, cutting, mowing, or cultivation, helps overcome this competition. Planting and harvesting should be scheduled during summer and fall when the chance of flooding is low. Woodlands need protection from grazing and wildfire.

This soil generally is not suitable for building site development and onsite waste disposal systems because of the flooding.

This soil is in land capability classification IIw. The woodland ordination symbol is 1o.

70—Beaucoup silty clay loam. This deep, nearly level, poorly drained soil is in low lying areas of the Mississippi River flood plain. It is subject to frequent flooding and ponding unless protected by a levee. Areas are in long, narrow swales or are irregular in shape and intermediate in position.

Typically, the surface layer is very dark grayish brown, firm silty clay loam about 9 inches thick. The subsurface layer is very dark gray, very firm silty clay loam about 10 inches thick. The subsoil is dark gray silty clay loam to a depth of 44 inches. The substratum to a depth of about 60 inches is dark grayish brown silty clay loam and stratified silt loam. In some areas, the subsoil is darker than the typical profile. In areas, the substratum is stratified with coarser and finer sediment.

Included with this soil in mapping are random areas of somewhat poorly drained soils that have stratified loamy texture throughout. The included soils make up about 6 percent of mapped areas.

The permeability of this soil is moderately slow, surface runoff is slow or ponded, and available water capacity is high. Reaction is neutral or mildly alkaline throughout. The surface layer is clayey enough to cause moderate difficulty in tillage and seedbed preparation. The natural fertility and organic matter content are high. Rooting depth is favorable. In most years during winter and spring, water is ponded or the seasonal high water table is within a depth of 2 feet. The shrink-swell potential is moderate.

Most areas have been cleared and are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and forage crops. Soil management concerns are providing surface drainage and keeping the soil in good tilth. Proper arrangement of fields and row direction helps provide surface drainage. Field ditches can be used to drain ponded areas if suitable outlets are available. Careful management is needed for good soil structure at planting time. Fall plowing generally is used. Because of the shrink-swell potential in the subsoil, deep tillage or subsoiling commonly provides little benefit. The fertility program is centered around the use of nitrogen for all nonlegume crops. More nitrogen is required to grow high yields of corn on this soil than on the more loamy, better drained soils.

Areas of this soil are suited to trees. Establishing seedlings and reducing windthrow can be improved by ridging the soil and planting larger stock than usual on the ridges and by thinning stands frequently but less intensively. Protection from flooding helps to increase seedling survival. Plant competition can be reduced by site preparation. Equipment limitations can be overcome by scheduling planting and harvesting during the dry periods of the year to avoid seasonal wetness and flooding. Equipment with flotation tires is an advantage to forestry operations during wet conditions. Woodlands should be protected from grazing and wildfire.

This soil generally is not suitable for building site development and onsite waste disposal systems because of the frequent flooding.

This soil is in land capability classification IIw. The woodland ordination symbol is 2w.

81A—Midco cherty silt loam, 1 to 3 percent slopes. This deep, nearly level, somewhat excessively drained soil is on narrow flood plains of small creeks and branches and in hollows. Most areas are subject to frequent flooding of brief duration. Areas are in long, narrow strips occupying 20 to about 100 acres.

Typically, the surface layer is dark brown cherty silt loam about 6 inches thick. Next is a transitional layer of dark yellowish brown cherty silt loam about 5 inches thick. Below this is stratified brown, dark brown, and dark yellowish brown very cherty loam and very cherty sandy loam. In some areas, the surface layer is very dark gray and is more than 10 inches thick.

The permeability of this soil is moderately rapid, surface runoff is slow, and available water capacity is low. Reaction is slightly acid or neutral in the surface layer and ranges from slightly acid to strongly acid below the surface layer. The surface layer is friable, but the chert content interferes with tillage. The natural fertility is medium, and the organic content is moderately low. The rooting depth is favorable.

Some areas of this soil have been cleared and are used for forage crops. Because of low yields, this soil is not commonly used for row crops. Where it is used for row crops, it is probably better suited to grain sorghum. This soil is droughty because of the low available water

capacity. The cherty surface layer is difficult to till, and seedbed preparation is difficult. Flooding is a hazard, and it hinders harvesting or planting during winter and spring. Maintaining a clear stream channel and using dikes, levees, and diversions help to prevent flooding. Applications of organic matter and returning crop residue help improve tilth and fertility and increase available water capacity.

This soil is suited to pasture and hay. Where areas are used for pasture, proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during periods of flooding help keep the pasture in good condition.

Most areas of this soil are in woodland of mixed hardwoods. This soil is suited to trees. Seeds and seedlings have a better chance of survival if competing vegetation is controlled. Seedbed preparation, prescribed burning, spraying, and cutting help to control vegetation. Release treatment is necessary in some areas to ensure development and growth. Planting special stock of a larger size than usual helps to achieve better survival. The planting and harvesting activities should be scheduled for times other than the normal flooding season. Forested areas need protection from grazing and wildfire.

This soil generally is not suitable for building site development, onsite waste disposal systems, and most recreational uses because of the flooding hazard. The use of dikes and levees or filling in the site above the normal flood level helps to overcome the hazard of flooding.

This soil is in land capability classification IIIs. The woodland ordination symbol is 4f.

82A—Bloomsdale silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on low lying narrow flood plains of branches and small creeks. This soil is subject to frequent flooding for brief periods. Areas commonly are long and narrow and range from 25 to 200 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. Next is a transition layer of brown silt loam about 13 inches thick. The substratum to a depth of 60 inches or more is brown very cherty clay loam underlain at 32 inches by dark brown extremely cherty clay loam and dark brown extremely cherty clay. In some areas, the dark surface layer is more than 10 inches thick. In some areas, more sand is throughout the profile.

Included with this soil in mapping are small areas of well drained Haymond and Ross soils. These soils do not have a cherty texture above a depth of 40 inches and are farther from the stream channel than the Bloomsdale soil. The included soils make up about 5 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is slow, and available water capacity is moderate. Reaction ranges from medium acid to neutral. The surface layer is friable and is easily tilled, but because of the shallow depth of the gravelly material, deep tillage mixes the substratum and surface material to an undesirable degree. The organic matter content is moderately low, and the natural fertility is medium. Rooting depth is partially restricted by the cherty substratum.

A small acreage of this soil is used for cultivated crops. This soil is suited to corn, soybeans, and grain sorghum but is droughty and subject to frequent flooding. The hazard of flooding is severe early in spring. Clearing the channel of obstructions and the use of levees, dikes, and diversions help to prevent flooding. The application of organic material to the surface and returning crop residue help improve fertility and increase the available water capacity.

Most areas have been cleared and are used for pasture and hay. This soil is suited to most commonly grown grasses and legumes for pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during periods of flooding help keep the pasture in good condition.

This soil is suited to trees, and many small areas remain in native hardwoods. Seedlings grow well if the competing vegetation is controlled. The hazard of flooding in spring can be avoided by scheduling the planting and harvesting activities in times other than the flooding season. Forested areas should be protected from grazing and wildfire.

This soil generally is not suitable for building site development, onsite waste disposal systems, and recreational uses because of the flooding hazard. The flooding hazard can be partially overcome by the use of dikes and levees or by filling in sites above the normal flood level.

This soil is in land capability classification IIe. The woodland ordination symbol is 3o.

83—Wabash silty clay. This deep, nearly level, very poorly drained soil is on low lying areas of the Mississippi River flood plain. Areas are in large, long, narrow depressions and are subject to occasional flooding for long periods. Flooding consists mostly of still backwater. Even where protected by a levee, these low lying areas commonly are wet late in winter.

Typically, the surface soil is very dark grayish brown silty clay about 12 inches thick. The subsoil to a depth of about 73 inches is very dark gray and dark gray, mottled, very firm silty clay. In some areas, the subsoil has thin loamy or sandy lenses.

The permeability of this soil is very slow, surface runoff is very slow or ponded, and available water capacity is moderate. Reaction is neutral or mildly alkaline throughout. The surface layer is clayey and is difficult to till. The natural fertility is high, and the organic matter content is moderate. Rooting depth is favorable,

however, root development is hindered by the wetness. A seasonal high water table is at or near the surface late in winter and during spring. The shrink-swell potential is very high.

Most areas are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and forage crops. Soil management consists of providing protection from flooding, surface drainage, and keeping the soil in good tilth. Proper arrangement of fields and row direction helps to provide surface drainage. Field ditches improve the surface drainage if adequate outlets are available. Careful management is needed to maintain good tilth at planting time. Fall plowing generally is used. Because of the shrink-swell potential in the subsoil, deep tillage or subsoiling commonly provides little benefit. Fertility programs are centered around the use of nitrogen for all nonlegume crops.

A few low lying areas of this soil are wooded. This soil is suited to bottom land trees. Tree seedlings and cuttings are difficult to establish because of the wetness. Planting and harvesting should be timed for periods when the soil is dry or frozen. Ridging the soil and planting on the ridges increase seedling survival. Plant competition is severe, and windthrow is a hazard. Providing surface drainage helps to increase seedling survival and reduces windthrow. Harvesting mature trees and thinning reduce stand density and windthrow damage. Careful and thorough site preparation reduces plant competition. Forested areas should be protected from grazing and wildfire.

This soil generally is not suitable for building site development because of flooding and wetness.

This soil is in land capability classification IIIw. The woodland ordination symbol is 4w.

93—Pits-Orthents complex. This complex consists of areas associated with quarrying of limestone and dolomite. Areas range from 10 to about 100 acres. They are about 80 percent Pits and 20 percent Orthents.

Pits are the open excavations from which soil and rock material have been removed. They generally do not support plant growth. Pits range from 10 to about 100 feet in depth. Small areas of water are common in some pits.

Orthents are the overburden or waste material that is piled onto nearby areas. This material is loamy or clayey and contains varying amounts of gravel, cobbles, stones, and boulders. Orthents are more variable than most of the other soils. Generally, permeability is moderately slow, available water capacity is moderate to low, and the organic matter content is low.

Pits generally are not suited to most uses. Orthents are suited to grasses and trees. Most areas of this map unit were left to revegetate by natural means. American sycamore, eastern cottonwood, and eastern redcedar are the most common trees to establish in areas. Some areas are suited to wildlife habitat.

This complex is not assigned to interpretive groups.

94—Dumps, mine. Dumps consist of finely pulverized material from the manufacture of limestone products. This material is piled in steep, flat-topped hills about 100 feet high. Individual areas are oval and range from 3 to 42 acres. Erosion and pollution of local streams are concerns.

These areas do not have vegetation or show any alteration of the material by soil-forming processes. The material is white, silty calcium carbonate or hydrated lime. Most of the material is finer than very fine sand, but some is weakly cemented into larger fragments.

This material can be used as a source of agricultural lime where magnesium is not needed. The hydrated lime is especially suited where a quick increase of pH is desirable. Screening is needed in some areas to remove large fragments and foreign material.

This map unit is not assigned to interpretive groups.

424—Haynie silt loam. This deep, nearly level, moderately well drained soil is on the Mississippi River flood plain. It is subject to frequent flooding unless protected by a levee. Areas commonly are large but range from 30 to 600 acres.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The underlying material to a depth of about 60 inches is stratified grayish brown and dark grayish brown silt loam and brown and grayish brown very fine sandy loam. In some areas, the very dark grayish brown surface layer is more than 10 inches thick. The surface layer is loam in some areas.

Included with this soil in mapping are scattered areas of soils that contain more fine sand than this Haynie soil and are lighter in color. The included soils make up about 6 percent of mapped areas.

The permeability of this soil is moderate, surface runoff is slow, and available water capacity is high. Reaction is mildly alkaline throughout. The surface layer is friable and is easily tilled. The natural fertility is high, and the organic matter content commonly is moderate. The rooting depth is favorable.

Most areas are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and forage crops. Areas are subject to frequent flooding unless protected by a levee. Protected areas are favorable for double cropping. Soil management concerns are providing surface drainage and keeping the soil in good physical condition. Proper arrangement of fields and row direction helps to provide surface drainage. Some areas are suitable for land leveling and irrigation. If this soil is tilled when too wet, it tends to form traffic pans or plowpans. Reducing tillage operations, subsoiling or chiseling, and maintaining organic matter content in the surface layer keep the soil in good physical condition. The fertility program is centered around the use of nitrogen for all nonlegume crops.

This soil is suited to grasses and legumes for pasture or hay. However, this is not a common land use. Grasses and legumes help to maintain tilth if they are grown in rotation with cultivated crops. Grazing when this soil is too wet or during flooding causes compaction and deterioration of pasture. Deferred grazing, proper stocking rates, and pasture rotation help to maintain soil tilth and pasture. Alfalfa is especially well suited.

Areas of this soil are suited to trees. Plant competition for seedlings is a major concern. Proper site preparation and maintenance by mowing, tillage, or chemicals help control the competing plants. Planting and harvesting should be scheduled during summer and fall when the chance of flooding is low. Woodlots should be protected from grazing and wildfire.

Although protection is provided for farming in some areas, this soil generally is not suitable for building site development and onsite waste disposal systems because of the flooding hazard.

This soil is in land capability classification IIw. The woodland ordination symbol is 1o.

590—Nameoki silty clay loam. This deep, nearly level, poorly drained soil is on the Mississippi River flood plain. It is subject to frequent flooding unless protected by a levee. In most areas the surface is ridges and swales. Areas range from 20 to about 500 acres.

Typically, the surface and subsurface layers are very dark gray silty clay about 15 inches thick. The subsoil is about 20 inches thick. It is dark gray and dark grayish brown, very firm silty clay in the upper part and dark grayish brown clay loam in the lower part. The substratum to a depth of 70 inches or more is grayish brown silt in the upper part and grayish brown sand in the lower part.

Included with this soil in mapping are small areas of soils that are loamy and lighter in color than this Nameoki soil and are on higher positions. The included soils make up about 4 percent of mapped areas.

The permeability of this soil is very slow, surface runoff is slow, and available water capacity is high. Reaction is neutral or mildly alkaline throughout. The surface layer is clayey and is difficult to till. The organic matter content is moderate, and the natural fertility is high. The rooting development is favorable. In most areas a seasonal high water table is at a depth of 1 foot to 3 feet during winter and spring. The shrink-swell potential is high.

Most areas are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and forage crops. Areas are subject to flooding unless protected by levees. Soil management concerns are providing surface drainage and keeping the soil in good tilth. Proper arrangement of fields and row direction helps to provide surface drainage. Field ditches can be used to drain ponded areas. Careful management is needed to maintain good tilth at planting time. Fall plowing generally is used; however, because of the shrink-swell potential in the subsoil deep tillage or subsoiling is not generally used. The fertility program is centered around the use of nitrogen for all nonlegume crops.

This soil generally is not suitable for building site development and onsite waste disposal systems because of frequent flooding.

This soil is in land capability classification IIIw. This soil is not assigned a woodland ordination symbol.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the best land for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland in Ste. Genevieve County may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season, acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service or the Missouri University Extension Service.

About 41,000 acres or 12 percent of Ste. Genevieve County meets the soil requirements for prime farmland. These areas are in bottom lands of the Mississippi River, in bottom lands of smaller creeks and rivers, and on scattered uplands. Most of these areas are in soil associations, 2, 4, 9, and 10 shown on the General Soil Map. About 65 percent of the prime farmland is used for cultivated crops, mainly for corn, wheat, and soybeans. Some areas are used for pasture or hay. A small acreage is forested.

Soil map units that make up prime farmland in Ste. Genevieve County are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units."

Soils that have limitations—a high water table and flooding—may qualify for prime farmland if these limitations are overcome. In table 5, the measures used to overcome these limitations, if they occur, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if these limitations have been overcome by corrective measures, or if some areas of the map unit are flooded less than once in 2 years during the growing season.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Approximately half of Ste. Genevieve County has been cleared. About 65,000 acres is used for cropland. Much of what is considered cropland is farmed in rotation with grass or legume meadow. Corn, wheat, soybeans, and grain sorghum are regularly grown on about 30,000 acres. Hay is harvested on nearly 22,000 acres of which 15 percent is alfalfa.

The potential of the soils for increased production of food is good. Most of the 79,000 acres of good cropland on nearly level to gentle slopes qualifies as prime farmland. An additional 100,000 acres of sloping soils are favorable for crop production where adequately protected from erosion. Food production may also be increased by extending the latest crop production technology to all cropland in the county. This survey can greatly facilitate the use of such technology.

The amount of urban and built-up land has increased considerably in the county during the last 15 years. Some of this has been in areas of good cropland, but most of it has been lake development property in areas generally poorly suited to farming. The use of this soil survey to help make land use decisions that influence farming and urban uses is discussed in the section "General Soil Map Units."

Soil erosion is the major hazard on most of the upland soils used for cropland. This is because most of these soils have a silt loam surface layer which is easily eroded by moving water. The erodible surface layer in combination with slopes of more than about 3 percent, or a slowly permeable layer, such as a fragipan, or both of these can lead to excessive erosion under continuous cultivation.

Loss of the surface layer reduces the fertility and available water capacity and results in poor tilth. This erosion is readily apparent on soils that have a fragipan, such as Hildebrecht, Jonca, Nicholson, and Union soils, and on soils that are moderately deep to bedrock, such as Caneyville and Lily soils. Erosion is not so apparent on soils that have little restriction to rooting, such as Crider and Menfro soils. Applications of fertilizers on these soils help to offset the losses in fertility caused by

Figure 15.—A field of corn in an area of Fourche silt loam, 5 to 9 percent slopes. Controlling erosion is essential to maintain the 85 bushel-per-acre average yield.

erosion, but many of the losses resulting from erosion are irretrievable. Control of erosion helps to keep the soil in place and thereby reduces the pollution of streams by sedimentation. Water quality is improved for farm and city uses and for wildlife habitats and recreation areas.

Erosion control practices provide protective cover for the soil surface or control the movement of water flowing over the surface. Protective cover can be crop residue or growing vegetation (fig. 15). Properly managed permanent pasture or hay crops can provide 80 percent or more of the protection needed. Crop rotations alternate cultivated crops and meadows to reduce erosion. Conservation tillage that does not invert the soil and leaves a protective cover of crop residue on the surface throughout the year can reduce sheet erosion by one half or more, when compared to fall plowing with a moldboard plow. An example of this is the shredding of corn stalks and chisel plowing in fall, followed by seedbed preparation in spring and leaving about 20 percent of the surface covered by crop residue after planting.

No-tillage systems, which leave nearly all of the crop residue on the surface, reduce the hazard of erosion. No-tillage systems can delay planting in spring somewhat because the soil dries more slowly under a cover of residue. Because of this, no-tillage systems are more difficult to use on the wetter soils, such as Auxvasse, Hildebrecht, Jonca, Nicholson, Union, and Wilbur soils. Contouring and contour stripcropping can be used on fields that have smooth uniform slopes. Terraces that divert the surface runoff to safe outlets can be used in some fields. Parallel terraces are much easier to farm than contour terrace systems. Terraces are more favorable on deep soils that have little or no rooting restriction, such as the Menfro, Minnith, Crider, Fourche, and Freeburg soils. Some soils are not favorable for terrace systems because of coarse fragments in the subsoil, such as Weingarten soils, or because of bedrock near the surface, such as Caneyville soils.

Soil fertility in the county ranges from high in the creek and river bottoms to low in most of the western part. Most soils on the Mississippi River bottom land are neutral to slightly alkaline. The silt loams and fine sands commonly are calcareous. They also are high in content of potassium and phosphorus. Only small applications of

lime and fertilizer, except for nitrogen on nonlegume crops, are needed for high levels of production. Other soils in the county tend to have low or moderate levels of phosphorus and potassium, unless they have had heavy applications of these fertilizers in the past.

Almost all of the upland soils in the area are naturally acid in the upper part of the root zone. Application of lime material is needed to raise the pH level of the soils for good growth of most crops. On all soils, the amount of fertilizer and lime used should be based on the results of soil tests, needs of the crops, and expected yield. The Cooperative Extension Service can help determine the kind and amount of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous. Most soils of the survey area used for cultivated crops have a silt loam surface layer that is low or moderately low in organic matter content. Generally, tilling of these silt loam soils weakens the structure and increases compaction and surface crusting. Tillage when these soils are too wet can further increase compaction, even below the plow layer. Subsoiling and varying depths of plowing help to reduce compaction and the formation of traffic pans. Regular additions of crop residue, barnyard manure, and other organic material help to improve tilth and reduce surface crusting.

Flooding is a major concern on soils along river bottoms of the county. Midco and Bloomsdale soils that commonly are in the upper reaches of stream bottoms are subject to frequent flash flooding. Haymond, Ross, and Wilbur soils are subject to common flooding of brief duration. Flooding generally is in the period from about December to April. Auxvasse and Ashton soils on stream terraces are rarely, if ever, flooded. An exception is along the lower reaches of creeks and rivers that flow into the Mississippi River. Soils in this area are subject to backwater flooding from the Mississippi River. This flooding is common and of long duration. It can extend for several miles up secondary streams. Close to the Mississippi River, floodwater can be high enough to flood the Ashton and Auxvasse soils on stream terraces. Much of the Mississippi River flood plain is protected by a levee. Recent floods have caused extensive damage to the levee system.

Artificial drainage of soils that have a high water table reduces excessive moisture during spring. Some areas of Auxvasse and Freeburg soils on terraces need additional drainage. Several areas of these soils have been drained by field ditches. Beaucoup, Nameoki, and Wabash soils in low lying areas of the Mississippi River bottoms are wet for long periods, and because of this crop yields are reduced. Surface drainage is adequate in only a few areas of these soils because of the lack of suitable outlets.

Supplemental irrigation increases production on some soils where water is available. Soils on the Mississippi River bottom land have high potential if supplemental irrigation is provided. Suitable water from wells commonly is at a relatively shallow depth in this part of the county. The smaller streams provide good quality water for limited irrigation. Most upland areas are not well suited to irrigation because of excess slope and the potential erosion hazard.

Tall fescue and orchardgrass are the most common pasture grasses in the area. These are cool-season grasses and produce most of their growth in spring and fall. Other cool-season grasses that are commonly grown are bluegrass, smooth brome, redtop, and timothy. Warm-season grasses produce most of their growth during summer and can be used to provide better quality forage during this time of the year. Warm-season grasses that can be grown are the bluestems, switchgrass, and indiangrass. Red clover and alfalfa are the most common legumes. They are grown in pure stands or with grasses and are used for hay and pasture. Lespedezas and white clover commonly are grown in mixed stands. Sweet clovers are used extensively as soil-improving crops. Some stands are used for hay and pasture.

Well managed stands of forages are effective in reducing soil erosion. The lack of adequate lime and fertilizer and overgrazing are common concerns. The amount of lime and fertilizer used should be based on the results of soil tests, the needs of the plants, and the expected production. The Cooperative Extension Service can help determine the kind and amount of lime and fertilizer to apply.

Overgrazing reduces the vigor and production of pasture. It also allows weedy and brushy species to increase. Common weedy species that increase are broomsedge bluestem, poverty oatgrass, woolly plantain, and ironweed. Overgrazing can be prevented by maintaining fertility, deferred grazing, rotational grazing, and by reducing the number of animals. Deferred grazing gives the forages a rest and allows them to build up carbohydrate reserves. Rotational grazing among several areas of pasture gives each area a rest period. The information in table 6 can be helpful in estimating the number of animals that can be carried in a pasture.

Many soils in the survey area have a high water table in spring. Where possible, grazing on these soils should be avoided when the surface layer is wet. The delay of grazing during wet periods helps to reduce compaction. Pasture renovation helps to overcome the compaction where it is a concern. Frost heaving of alfalfa and red clover is more of a hazard on the soils that have a high water table. Stubble, 4 to 6 inches in height, left during winter helps to reduce frost heaving. Grass-legume mixtures can help to reduce frost heaving.

Although the acreage is limited, barley, oats, white corn, Irish potatoes, strawberries, apples, and peaches have been grown commercially in the county. Christmas trees are grown in the western part of the county. Other

crops that have potential are sunflowers, blueberries and other fruit, vegetables, nuts, grapes, and nursery plants. Sugar beets have been grown experimentally on soils in the Mississippi River bottom land.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*18*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Soils in Ste. Genevieve County are not in Classes V or VIII.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, or *s*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

James L. Robinson, forester, Soil Conservation Service, and Edward A. Brown, resource forester, Missouri Department of Conservation, assisted in the preparation of this section.

Originally, about 93 percent of Ste. Genevieve County was forested. Scattered areas of native grassland on the shallow Gasconade soils provided natural openings in an otherwise continuous forest. Significant forest clearing by settlers started in the early 1800's.

During early logging operations, most of the virgin pine was harvested by the large timber companies. Remnants of these older pine stands still exist near the Hawn Park area. After the pine was harvested, hardwood lumber companies removed the oak and other hardwoods for

railroad ties, staves, and lumber. Fuelwood for steamboats and domestic use was also an important consumptive use of the area's forests. Local pine and oak were harvested to construct and maintain the plank road that connected Iron Mountain in St. Francois County with Ste. Genevieve during the 1850-57 period.

As settlement increased, burning and heavy grazing of the forest became common practices. These practices were very detrimental to the young developing forests.

In recent years, much of the logging practices resulted in "high grading" of timber stands. This practice leaves less favorable species and poor quality trees to compete with younger high quality trees.

Forty-nine percent of Ste. Genevieve County is forested according to a survey conducted in 1972 (*19*). This represents a loss of more than 7 percent since 1959. It is estimated that 71 percent of the forest needs improvement (*12*).

SOIL AND TREE RELATIONSHIPS. Soils help to provide a basic understanding of how forest types and tree growth occur. Some of these relationships have been recognized for a long time—white oak grow well on deep, moist soils, and blackjack or post oak are dominant where rooting depth is restricted or moisture supply is limited. The soil serves as a reservoir for moisture, provides an anchor for roots, and supplies most of the available nutrients. Soil properties that affect, directly or indirectly, these growth requirements include reaction, fertility, drainage, texture, structure, depth, and position in the landscape.

Available water capacity is primarily influenced by texture, rooting depth, and content of stones and chert. Deep loamy soils, such as Crider or Menfro soils, have high available water capacity. The content of chert or stone affects the amount of available water in Goss and Ramsey soils. Stone and chert content in the subsoil is more affective than the content in the surface layer. Also affecting available water capacity are features, such as a fragipan and bedrock, that restrict root development. Hildebrecht, Jonca, and Wilderness soils have a fragipan and are common in forests; Ramsey and Gasconade soils are shallow to rock; and Caneyville and Lily soils are moderately deep to rock. Although little can be done to change these physical limitations, timber stand improvement and thinning are useful in management.

Nutrient supply also affects tree growth. The role of the mineral horizons in the soil is important. The subsoil in many upland soils has been leached and as a result contains few nutrients; the underlying material in most bottomland soils is higher in amounts of nutrients.

Of importance to the mineral horizons of the soil is the leaf litter on the surface. Decomposition of this layer recycles nutrients that have accumulated in the forest ecosystem over long periods of time. Fire, excessive trampling by livestock, and erosion can result in the loss of these nutrients. Forest management needs to include prevention of wildfire and protection from overgrazing.

Other site characteristics that affect tree growth are aspect and position in the landscape. These influence such factors as the amount of sunlight (or energy) available, air drainage, soil temperature, and moisture relations. North- and east-facing slopes are the better sites for tree growth in the area.

FOREST TYPES. Most of the woodlands in the county are either the oak-hickory or oak-pine forest type. Other forest types of the county are maple-oak, eastern redcedar-scrub oak, and ash-cottonwood.

The oak-hickory forest type is dominant in the Goss-Weingarten-Hildebrecht (fig. 16), Goss-Menfro-Gasconade, Wilderness-Union, Menfro, and Minnith-Menfro associations. The major trees are northern red oak, white oak, post oak, black oak, shagbark hickory, and mockernut hickory. Northern red oak and white oak are on the more productive sites. These sites are on the deep soils at the base of hills and on north- and east-facing slopes throughout the county. Blackjack oak, post oak, black oak, and hickories, commonly pignut or black hickory, are on the less productive sites. These sites generally are on ridgetops on soils that have restricted rooting depth because of a fragipan or bedrock and on soils on south- and west-facing slopes. Examples are Hildebrecht, Jonca, and Wilderness soils with a fragipan and Lily and Ramsey soils that have bedrock within a depth of about 40 inches. These shallow soils support less growth than the deeper soils.

The oak-pine forest type consists of the same tree species as the oak-hickory, with the addition of shortleaf pine. The oak-pine forest type is dominant in the Jonca-Lily and Lily-Ramsey associations and commonly is intermittent and not uniform in distribution. Typically, oak-pine forests are on ridgetops and southwest-facing slopes.

The shortleaf pine was once more extensive than it is now. Pine heartwood from decaying stumps is common in many areas. Much of these areas today supports stands of hardwoods. The reason for this is that shortleaf pine seedlings require full sunlight for successful regeneration (fig. 17).

The maple-oak forest type probably occupied most of the Fourche-Caneyville-Crider association and the lower side slopes, coves, and valleys of the other associations throughout the county prior to the settlement of the county. Most of these areas were selected for settlement and were cleared for farming purposes. Hard maple, northern red oak, black oak, white ash, and eastern redcedar are the common species. Small remnants of this forest are along some of the steeper slopes.

The eastern redcedar-scrub oak forest type is in parts of the Goss-Weingarten-Hildebrecht, Goss-Menfro-Gasconade, and Fourche-Caneyville-Crider associations. This forest type is in small areas, called glades, where the bedrock is near the surface. Gasconade soils typically have this forest type unless disturbed. The main tree species are eastern redcedar, chinkapin oak, white

ash, and winged elm. In some areas, the trees are sparse and the openings contain many native grasses, wildflowers, and shrubs. Common native grasses include big bluestem, little bluestem, indiangrass, and sideoats grama. Typical wildflowers are Missouri evening primrose, prairie dock, pricklypear, and sunflowers.

The ash-cottonwood forest type is in the Haymond-Ross-Ashton association along bottoms of small rivers and creeks throughout the county and in the Haynie-Wabash-Nameoki association on the Mississippi River flood plain. Tree species, in addition to the eastern cottonwood and green ash, are American elm, American sycamore, hackberry, river birch, soft maples, willows, shellbark hickory, and pecans. A few pecan trees remain among cultivated fields on the Mississippi River bottom land.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Figure 16.—Natural reforestation on a ridgetop after clear cutting in an area of Hildebrecht silt loam, 3 to 9 percent slopes.

Figure 17.—A wooded area of Union silt loam, 3 to 9 percent slopes, in the Mark Twain National Forest. The native hardwoods on the left are in contrast to the shortleaf pine on the right. The pine were planted after clear cutting.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly (fig. 18). A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several

Figure 18.—Windthrow is common on soils that have a shallow rooting depth. An example is this shortleaf pine on Ramsey stony loam, 14 to 35 percent slopes.

rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Missouri Department of Conservation, or the Cooperative Extension Service or from a nursery.

Recreation

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

The facility inventory portion of the 1980 Statewide Comprehensive Outdoor Recreation Plan (SCORP) shows 19,501 acres of recreation developments in Ste. Genevieve County (*15*). Ownership of the areas is 50 percent federal, 14 percent state, 22 percent private, and 14 percent combined county, municipal, school, and others. The recreation developments include water sports areas, swimming pools, a golf course, hunting and fishing areas, campgrounds, ballfields, playgrounds, game courts, trails, historic sites, fairgrounds, and picnicking areas (fig. 19).

The Mark Twain National Forest occupies 9,869 acres and is the largest public recreation area in the county. Hawn State Park is 2,600 acres and has sites for camping, picnicking, and hiking. The Hickory Canyons Natural Area and the Coffman Towersite have a total of 865 acres and are important public recreation areas.

The 1974 Nationwide Outdoor Recreation Inventory lists private and semi-private commercial recreation enterprises in the county (*5*). These enterprises include a golf course, a campground, a fee fishing lake, and nine historic buildings. In this inventory, county public fishing areas and fee hunting areas are listed as major recreational needs.

SCORP projections indicate a 44.4 percent expected increase in population in the county in the period 1970 to 1990 (*6*). The existing recreational base should supply the demand for the predicted population increase.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning

Figure 19.—Small lakes provide numerous private recreational areas throughout the county.

recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The

surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

Ste. Genevieve County is one of the thirteen counties that comprise the Northern and Eastern Ozark Border Zoogeographic Region in Missouri. Originally, nearly all of this region was wooded; today, less than half remains in this cover type (*13*). Important features for wildlife habitat in Ste. Genevieve County are the widespread interspersion of woodland and cleared land and the abundant edge growth of favorable quality for upland game. The combination of topography, cover, and land use provides good to excellent habitat for wildlife.

Today, approximately 55 percent of the land in the survey area is in some form of woody vegetation. This includes the smaller species such as shrubs and other brushy growth forms. About 20 percent is cropland, and 22 percent is hay and pasture.

In the Goss-Weingarten-Hildebrecht, Goss-Menfro-Gasconade, Wilderness-Union, and Lily-Ramsey associations, woody vegetation is dominant. These associations provide the majority of the habitat for woodland wildlife species. Timber in the other associations adds to this habitat base. Populations of deer and turkey are excellent in the county. The fox squirrel and gray squirrel populations are only fair. There is a small resident population of woodcock.

The number of furbearers ranges from fair to good. Raccoon, opossum, muskrat, fox, coyote, mink, striped skunk, and beaver are the major species in the county.

Approximately 42 percent of the county is classified as cropland and grassland. The Jonca-Lily, Menfro, Minnith-Menfro, Fourche-Caneyville-Crider, Haymond-Ross-Ashton, and Haynie-Wabash-Nameoki associations provide the majority of openland wildlife habitat in Ste. Genevieve County. The population of quail and rabbits is poor to fair. A loss in the amount of edge growth has reduced habitat quality in these associations for these game species. A fair to good resident population of mourning dove is increased each year by migratory flights of this game bird. The county's songbird population is good to excellent in all habitat types.

True wetlands are nearly nonexistent within the survey area. The Haynie-Wabash-Nameoki and Haymond-Ross-Ashton associations provide the only remaining wetland and major riverine habitat within the county. A few waterfowl concentration areas along the Mississippi bottom lands provide habitat at times for Canada geese, blue-winged teal, mallards, and wood ducks. Good wood duck populations can still be found on those portions of Establishment and Saline Creeks that meet the birds' strict habitat requirements. Overall, waterfowl populations are poor to fair. The wetland wildlife habitat type is by far the smallest of the three major types in the survey area.

There are 110 miles of perennial streams in the county (*6*). Those rated best for fishing are the Mississippi River, River Aux Vases, and Little Saline, North Fork Saline, Coldwater, Jonca, Pickle, and Establishment Creeks. Principal fish in the Mississippi River are channel, blue, and flathead catfish, carp, buffalo, walleye, white bass, crappie, and sturgeon. The main species of fish in the remaining waters are smallmouth bass, goggle-eye, channel catfish, and various species of sunfish.

There are no free public fishing lakes in the county. Many of the existing impoundments are associated with lakeside housing developments or private camps, and their access is restricted. One large fee fishing lake is available. There are approximately 3,000 private farm ponds and small lakes in the survey area which have been stocked with largemouth bass, channel catfish, bluegill, and in the larger impoundments, crappie.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be

established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, millet, soybeans, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bluegrass, switchgrass, indiangrass, trefoil, crownvetch, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridgepea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, persimmon, sassafras, wildplum, sumac blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, Amur honeysuckle, hawthorn, and hazel.

Coniferous plants furnish winter cover, browse, and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cutgrass, cattail, rushes, sedges, and buttonbush.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, red fox, woodchuck, and mourning dove.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils

may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrink-swell potential can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic

matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit

revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity,

infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is

not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*20*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*17*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*20*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Ashton Series

The Ashton series consists of deep, well drained soils on low stream terraces. These soils formed in silty alluvium. Permeability is moderate. Slope ranges from 0 to 3 percent.

The Ashton soils in Ste. Genevieve County have a lighter colored surface layer than defined as the range for the series. This difference does not significantly alter the use or behavior of these soils.

Ashton soils are similar to Menfro soils and commonly are adjacent to the Auxvasse, Freeburg, and Haymond soils. Auxvasse soils have a grayish brown clayey

subsoil. Freeburg soils have mottles of 2 chroma in the upper part of the B horizon. Auxvasse and Freeburg soils are on higher stream terraces than Ashton soils. Menfro soils have more clay in the subsoil. Haymond soils have less clay and are lower on first bottom positions.

Typical pedon of Ashton silt loam, 0 to 3 percent slopes; about 2 1/2 miles west of St. Marys, 2,900 feet west and 1,950 feet south of the northeast corner sec. 36, T. 37 N., R. 9 E.; UTM coordinates 4,195,420 meters N. and 236,890 meters E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine and very fine roots; common worm casts; neutral; abrupt smooth boundary.

A—7 to 12 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure parting to moderate fine granular; friable; common fine and very fine roots; neutral; clear smooth boundary.

BA—12 to 24 inches; brown (7.5YR 4/4) silt loam; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; common very fine roots; common worm casts; neutral; clear smooth boundary.

Bt1—24 to 39 inches; brown (7.5YR 5/4) silt loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct dark reddish brown (5YR 3/4) clay films on faces of peds; few fine roots; slightly acid; clear smooth boundary.

Bt2—39 to 58 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; few faint clay films on faces of peds and in pores; few thin silt coats; few fine roots; medium acid; gradual smooth boundary.

C—58 to 72 inches; brown (7.5YR 4/4) silt loam; massive; friable; few faint clay films in pores; few thin silt coats; few fine roots; slightly acid.

The thickness of the solum ranges from about 48 to 60 inches. Reaction ranges from neutral to medium acid throughout.

The A horizon has value of 3 or 4 and chroma of 2 to 3. Dry value commonly is 6. The BA horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam and averages between 20 and 30 percent clay. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam, loam, and less commonly fine sandy loam.

Auxvasse Series

The Auxvasse series consists of deep, poorly drained soils on stream terraces. These soils formed in loess and clayey alluvium. Permeability is very slow. Slope ranges from 0 to 3 percent.

Auxvasse soils commonly are adjacent to Ashton, Freeburg, and Haymond soils on flood plains. Ashton and Haymond soils are brown or dark brown and have less clay than Auxvasse soils. Ashton soils are on slightly lower positions, and Haymond soils are lower on the flood plain. Freeburg soils are not so gray, have less clay, and are on higher positions.

Typical pedon of Auxvasse silt loam, 0 to 3 percent slopes; in a fescue pasture, 1,400 feet south and 200 feet west of the northeast corner sec. 15, T. 36 N., R. 9 E.; UTM coordinates 4,190,710 meters N. and 762,350 meters E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular structure; friable; many fine roots; few fine dark concretions; slightly acid; abrupt smooth boundary.

E—6 to 13 inches; light brownish gray (2.5Y 6/2) silt loam with 10 percent mixing of brown (10YR 4/3); weak fine granular structure; friable; common fine roots; few fine dark concretions; few worm casts; slightly acid; abrupt smooth boundary.

B/E—13 to 16 inches; brown (10YR 5/3) silty clay loam (Bt); moderate fine subangular structure; friable; light brownish gray (2.5Y 6/2) silt coatings 1 millimeter to 4 millimeters thick, (E) white (10YR 8/1) dry, on faces of peds and fillings between peds; common fine roots; few fine dark concretions; medium acid; abrupt smooth boundary.

Btg—16 to 31 inches; grayish brown (2.5Y 5/2) silty clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine prismatic structure parting to moderate very fine subangular blocky; very firm; common fine roots; common distinct clay films; few dark concretions; very strongly acid; gradual smooth boundary.

BCg—31 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine roots; few dark concretions; very strongly acid; clear smooth boundary.

Cg—44 to 72 inches; grayish brown (2.5Y 5/2) silty clay loam, stratified with 30 percent grayish brown (2.5Y 5/2) very fine sandy loam; common medium distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure and massive; friable; few fine roots and pores; few dark concretions; medium acid.

The thickness of the solum ranges from about 40 to 60 inches.

The Ap horizon has value of 4 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 2 or 3. Combined thickness of the A and E horizons ranges from 12 to 22 inches. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Some

pedons have a thin Bt1 horizon with chroma of 3. The Bt horizon is silty clay or clay. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Beaucoup Series

The Beaucoup series consists of deep, poorly drained soils on the Mississippi River flood plain. These soils formed in silty alluvium. Permeability is moderately slow. Slope ranges from 0 to about 2 percent.

Beaucoup soils commonly are adjacent to Haynie, Nameoki, and Wabash soils. Both Nameoki and Wabash soils contain more clay than Beaucoup soils. They are on lower positions or on positions similar to those of the Beaucoup soils. Haynie soils contain less clay and are on higher positions.

Typical pedon of Beaucoup silty clay loam; in a cultivated field, 700 feet west and 420 feet south of the northeast corner sec. 27, T. 38 N., R. 9 E.; UTM coordinates 4,206,640 meters N. and 761,810 meters E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; firm; mildly alkaline; abrupt smooth boundary.

A—9 to 19 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine angular blocky structure; very firm; mildly alkaline; clear smooth boundary.

Bg—19 to 36 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; moderate fine angular blocky structure; firm; mildly alkaline; clear smooth boundary.

BCg—36 to 44 inches; dark gray (10YR 4/1) silty clay loam; weak fine subangular blocky structure; firm; about 20 percent strata of pale brown (10YR 6/3) silt loam; mildly alkaline; clear smooth boundary.

Cg—44 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; massive along strata; firm; 40 percent strata of grayish brown (10YR 5/2) friable silt loam; mildly alkaline.

The thickness of the solum ranges from about 35 to 50 inches. The solum is neutral or mildly alkaline throughout and commonly is weakly to strongly effervescent below a depth of 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 1 or 2. It commonly is silty clay loam and silt loam but has thin strata of silty clay in some pedons. The C horizon has hue of 2.5Y or 10YR, value of 4 through 6, and chroma of 1 or 2. It is silt loam, very fine sandy loam, fine sandy loam, fine sand, or silty clay loam and commonly is stratified.

Bloomsdale Series

The Bloomsdale series consists of deep, well drained soils on flood plains of small streams. These soils formed in loamy and clayey alluvium. Permeability is moderate. Slope ranges from 0 to 3 percent.

Bloomsdale soils are similar to the Midco soils and are adjacent to Haymond and Ross soils on the flood plains. Haymond soils are silt loam to a depth of 40 inches or more, and Ross soils have a thick dark surface layer. Haymond and Ross soils do not have coarse fragments, and they are farther from the stream channel than Bloomsdale soils. Midco soils are sandier and range to more acid conditions.

Typical pedon of Bloomsdale silt loam, 0 to 3 percent slopes; in mixed hardwoods, 1,650 feet south and 250 feet west of the northeast corner sec. 24, T. 36 N., R. 8 E.; UTM coordinates 4,188,690 meters N. and 755,930 meters E.

A—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

AC—7 to 20 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; common fine and medium roots; about 5 percent fine chert fragments; neutral; gradual smooth boundary.

2C—20 to 32 inches; brown (7.5YR 4/4) very cherty clay loam; weak very fine subangular blocky structure; friable; common fine roots; 55 percent chert fragments of which 8 percent is coarse; slightly acid; abrupt smooth boundary.

3Btb1—32 to 48 inches; dark brown (7.5YR 3/2) extremely cherty clay loam, brown (7.5YR 4/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; few faint clay films; 80 percent chert fragments of which 20 percent is coarse; medium acid; gradual wavy boundary.

3Btb2—48 to 60 inches; dark brown (7.5YR 3/4) extremely cherty clay; moderate fine subangular blocky structure; firm; few fine roots; common fine distinct clay films; 60 percent chert fragments of which 20 percent is coarse; slightly acid.

The thickness of the alluvium and the depth to bedrock are more than 60 inches. Reaction ranges from medium acid to neutral throughout. Thickness of the noncherty overburden ranges from 12 to about 24 inches.

The A and AC horizons have value of 3 or 4 and chroma of 2 or 3. Dry value is 6 or more. The A and AC horizons are 0 to 15 percent chert. The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is very cherty or extremely cherty analogues of clay loam or clay. The 3Btb horizon has hue of 10YR,

7.5YR, and on rare occasions 5YR, value of 3 to 5, and chroma of 2 to 4. It is very cherty or extremely cherty clay or clay loam.

Caneyville Series

The Caneyville series consists of moderately deep, well drained soils on upland ridgetops and side slopes. These soils formed in residuum. Permeability is moderately slow. Slope ranges from 3 to 20 percent.

Caneyville soils commonly are adjacent to Crider, Fourche, Nicholson, and Gasconade soils. Crider, Fourche, and Nicholson soils are deep, have less clay, and are on positions similar to those of Caneyville soils. In addition, Nicholson soils have a fragipan. Gasconade soils are shallow, have a dark surface layer, and are on similar positions.

Typical pedon of Caneyville silt loam, 3 to 9 percent slopes; in pasture, 1,500 feet north and 2,100 feet east of the southwest corner sec. 36, T. 36 N., R. 7 E.; UTM coordinates 4,184,410 meters N. and 745,370 meters E.

Ap—0 to 4 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

BA—4 to 7 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many very fine roots; neutral; abrupt wavy boundary.

Bt1—7 to 12 inches; reddish brown (5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; many fine roots; few faint clay films; slightly acid; clear wavy boundary.

Bt2—12 to 18 inches; brown (7.5YR 4/4) silty clay; common fine black stains; moderate very fine subangular blocky structure; very firm; common very fine roots; common faint clay films; common fine dark concretions; slightly acid; clear wavy boundary.

Bt3—18 to 25 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; very firm; common very fine roots; common distinct clay films; many fine dark concretions; neutral; abrupt irregular boundary.

R—25 inches; hard dolomite bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. Stones on the surface are common in some pedons.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is slightly acid or neutral. The Bt horizon has hue of 5YR, 7.5YR, 10YR, on rare occasions 2.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, silty clay, or clay. The clay content increases as depth increases and averages 35 to 50 percent. The Bt horizon is medium acid to mildly alkaline.

Carr Series

The Carr series consists of deep, well drained soils on flood plains. These soils formed in calcareous stratified alluvium. Permeability is moderately rapid. Slope ranges from 0 to 2 percent.

Carr soils are similar to Haymond soils and commonly are adjacent to Beaucoup, Haynie, Nameoki, and Wabash soils on the Mississippi River flood plain. Haymond soils are silty throughout. Beaucoup, Nameoki, and Wabash soils are more clayey than Carr soils and have grayer colors. Haynie soils contain less sand and more silt.

Typical pedon of Carr fine sandy loam; in a cultivated field, 1,800 feet east and 50 feet north of the southwest corner sec. 31, T. 38 N., R. 10 E.; UTM coordinates 4,204,015 meters N. and 238,730 meters E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many very fine roots; weak effervescence; mildly alkaline; abrupt smooth boundary.

C1—9 to 16 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; common very fine roots; strong effervescence; mildly alkaline; clear smooth boundary.

C2—16 to 32 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weakly stratified fine sandy loam; massive; friable; few very fine roots; violent effervescence; mildly alkaline; clear smooth boundary.

C3—32 to 60 inches; grayish brown (10YR 5/2) loamy very fine sand; massive parting to single grain; very friable; loose when dry; strong effervescence; mildly alkaline.

The thickness of the solum ranges from about 6 to 18 inches and is the same as the thickness of the A horizon. The solum is mildly alkaline to moderately alkaline throughout, except the surface layer is neutral in some pedons. Free carbonates also are present throughout except in the surface layer of some pedons.

The A horizon has value of 3 or 4 and chroma of 2 or 3. Dry value is 5 to 7. The C horizon commonly has value of 4 to 6 and chroma of 2 or 3. A thin buried layer is present in some pedons. It has value of 2 or 3 and typically is fine sandy loam but ranges to loam, loamy fine sand, or very fine sandy loam. In some pedons, a 2C horizon of loamy sand or fine sand is below a depth of 40 inches.

Crider Series

The Crider series consists of deep, well drained soils on upland ridges and side slopes. These soils formed in loess and residuum or other silty and clayey materials.

Permeability is moderate. Slope ranges from 3 to 14 percent.

Crider soils are similar to Menfro soils and commonly adjacent to Caneyville, Fourche, Gasconade, and Nicholson soils. Menfro soils formed in thick loess and are not red and clayey in the lower part of the subsoil. Caneyville soils are moderately deep to bedrock and are in the heads of drainageways or on similar positions. Fourche and Nicholson soils are not so red as Crider soils and are on positions similar to those of Crider soils. Nicholson soils have a fragipan. Gasconade soils are darker, shallow to bedrock, and are on steeper positions at a lower elevation.

Typical pedon of Crider silt loam, 3 to 9 percent slopes; 2,400 feet west and 1,650 feet south of the northeast corner sec. 3, T. 37 N., R. 6 E.; UTM coordinates 4,203,350 meters N. and 732,710 meters E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

BA—9 to 13 inches; brown (7.5YR 5/4) silt loam; moderate very fine subangular blocky structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—13 to 29 inches; brown (7.5YR 4/4) silty clay loam; strong fine subangular blocky structure; firm; common fine roots; few faint clay films; medium acid; clear wavy boundary.

2Bt2—29 to 36 inches; red (2.5YR 4/6) silty clay loam; common medium brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; firm; many fine roots; common faint clay films; common black oxide stains; strongly acid; clear irregular boundary.

2Bt3—36 to 65 inches; red (2.5YR 4/6) silty clay; common fine brown (7.5YR 5/4) mottles; moderate fine subangular blocky structure; very firm; common distinct clay films; common black stains; slightly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches and commonly more than 100 inches. Chert fragments range from 0 to 15 percent in the 2B horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. It ranges from neutral to medium acid. The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from slightly acid to strongly acid. The 2Bt horizon commonly has hue of 5YR or 2.5YR but in some pedons has hue of 7.5YR or 10R. It has value of 4 or 5 and chroma of 4 to 6. The upper part of the 2B horizon in some pedons is silty clay loam, but commonly the 2B horizon is silty clay or clay. The 2Bt horizon ranges from slightly acid to strongly acid.

Fourche Series

The Fourche series consists of deep, moderately well drained soils on upland side slopes and ridgetops. These soils formed in loess and residuum or other clayey material. Permeability is moderately slow. Slope ranges from 2 to 9 percent.

Fourche soils commonly are adjacent to Caneyville, Crider, Gerald, and Nicholson soils. Caneyville soils are moderately deep to bedrock and are lower on the side slopes than Fourche soils. Crider soils do not have gray mottles and are lower on the narrow ridges. Gerald soils are clayey in the upper part of the subsoil and have a fragipan. Nicholson soils have a fragipan. Gerald and Nicholson soils are slightly higher on the ridges.

Typical pedon of Fourche silt loam, 5 to 9 percent slopes; in a pasture, 1,300 feet south and 300 feet east of the northwest corner sec. 31, T. 36 N., R. 8 E., Survey 1877 near Coffman; UTM coordinates 4,185,310 meters N. and 746,830 meters E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; friable; many very fine roots; slightly acid; clear smooth boundary.

Bt1—6 to 22 inches; brown (7.5YR 4/4) silty clay loam; moderate medium prismatic structure parting to fine subangular blocky; firm; few faint clay films; many very fine roots; slightly acid; clear smooth boundary.

Bt2—22 to 27 inches; brown (7.5YR 4/4) silty clay loam; thin yellowish brown silt coatings on faces of peds; strong fine prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; few faint clay films; few black stains; medium acid; abrupt wavy boundary.

2B/E—27 to 30 inches; reddish brown (5YR 4/4) silty clay loam ped interiors (Bt), strong brown (7.5YR 5/4) silty clay loam kneaded; very pale brown (10YR 7/3) silt coatings (E) 1 millimeter to 4 millimeters thick covering most faces of peds, white (10YR 8/1) dry; strong fine prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine roots; few faint clay films on faces of peds; common black stains; medium acid; clear wavy boundary.

2Bt3—30 to 41 inches; reddish brown (5YR 4/4) silty clay; common coarse prominent brown (10YR 5/3) and few fine prominent light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; few distinct clay films on faces of peds; common black stains and few fine concretions of iron and manganese oxides; medium acid; gradual smooth boundary.

2Bt4—41 to 76 inches; reddish brown (5YR 4/4) silty clay; few to common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and very fine

subangular blocky structure; firm; few very fine roots; few distinct clay films on faces of peds; common to many black stains and few fine concretions of iron and manganese oxides; neutral.

The thickness of the solum ranges from 60 to about 100 inches and commonly coincides with the depth to bedrock. Thickness of loess above the 2B horizon ranges from about 24 to 36 inches.

The A horizon has value of 4 and chroma of 2 or 3. It is medium acid to neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The E part of the 2B/E horizon consists of silt coatings that have hue of 10YR, value of 6 or 7, and chroma of 2 or 3. It ranges from very strongly acid to slightly acid and is silty clay loam. The 2Bt horizon has hue of 10YR through 5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from very strongly acid to neutral and is silty clay or clay.

Freeburg Series

The Freeburg series consists of deep, somewhat poorly drained soils on high stream terraces or benches. These soils formed in loess underlain by loamy alluvium. Permeability is moderately slow. Slope ranges from 0 to 3 percent.

Freeburg soils are similar to the Minnith soils and are adjacent to the Ashton and Auxvasse soils on stream terraces. Ashton soils do not have mottles of 2 chroma and are brown throughout. Auxvasse soils are grayer throughout and have a clayey subsoil. Both of these soils are on lower positions than Freeburg soils. Minnith soils have a thinner A horizon and do not have mottles of 2 chroma in the upper part of the B horizon.

Typical pedon of Freeburg silt loam, 0 to 3 percent slopes; in pasture, 2,350 feet north and 1,500 feet west of the southeast corner sec. 36, T. 37 N., R. 9 E.; UTM coordinates 4,195,100 meters N. and 237,360 meters E.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; friable; many very fine roots; common fine pores; neutral; clear wavy boundary.

E—10 to 19 inches; brown (10YR 5/3) silt loam; weak thin platy structure; very friable; common very fine roots; strongly acid; abrupt wavy boundary.

Bt1—19 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; firm; few very fine roots; common faint dark brown (7.5YR 4/4) clay films; strongly acid; gradual smooth boundary.

Bt2—35 to 47 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few very fine roots; common distinct clay films; strongly acid; gradual smooth boundary.

BC—47 to 60 inches; mottled, grayish brown (10YR 5/2) and dark brown (7.5YR 4/4) silty clay loam; weak medium prismatic structure; friable; few fine distinct very dark brown (10YR 2/2) clay films or stains; medium acid.

The thickness of the solum ranges from about 48 to 72 inches. Combined thickness of the A and E horizons ranges from 10 to about 24 inches.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. It is slightly acid or neutral. The E horizon has value of 5 or 6 and chroma of 2 to 4. It ranges from strongly acid to neutral. The Bt horizon has value of 4 to 6 and chroma of 1 to 6. It ranges from very strongly acid to neutral. The BC and C horizons have a noticeable increase of very fine and fine sand and stratification of these textures.

Gasconade Series

The Gasconade series consists of shallow, somewhat excessively drained soils on side slopes on uplands. These soils formed in residuum from dolomite and limestone. Permeability is moderately slow. Slope ranges from 9 to 50 percent.

Gasconade soils commonly are adjacent to Caneyville, Crider, Fourche, Goss, Menfro, Minnith, and Weingarten soils. These soils are deeper to bedrock than Gasconade soils. Caneyville and Goss soils are on positions similar to those of Gasconade soils. Crider, Fourche, Menfro, and Weingarten soils commonly are on higher positions. Minnith soils are on lower positions.

Typical pedon of Gasconade stony silty clay loam, 9 to 35 percent slopes; on a southwest slope under a partial canopy of eastern redcedar, approximately 1,700 feet north and 1,850 feet west of the southeast corner sec. 1, T. 36 N., R. 9 E., Survey 3060; UTM coordinates 4,193,540 meters N. and 237,140 meters E.

A—0 to 8 inches; very dark gray (10YR 3/1) stony silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine and very fine granular structure; friable; many fine roots; about 10 percent of surface covered by limestone fragments; soil mass contains about 25 percent stones, 25 percent flagstones, 12 percent channers; mildly alkaline; clear smooth boundary.

Bw—8 to 14 inches; very dark grayish brown (10YR 3/2) stony silty clay loam, dark brown (7.5YR 3/2) dry; moderate medium subangular blocky structure; firm; common fine roots; about 32 percent stones, 25 percent flagstones, 12 percent channers; mildly alkaline; clear smooth boundary.

R—14 inches; fractured white hard limestone bedrock; cracks and crevices filled with dark brown (7.5YR 3/2) silty clay loam and some fine chert fragments.

Thickness of the solum and the depth to bedrock range from about 4 to 20 inches. Rock fragments range from 35 to 75 percent, by volume, but the coarse fragments less than 6 inches long average less than 35 percent. The solum is neutral or mildly alkaline.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. It is stony analogues of silty clay, silty clay loam, or clay loam.

Gerald Series

The Gerald series consists of deep, somewhat poorly drained soils on upland divides of the Farmington Plain. These soils formed in thin loess, other loamy sediment, and the underlying clayey residuum. Permeability is very slow. Slope ranges from about 1 to 4 percent.

The Gerald soils in Ste. Genevieve County have higher chroma in the A horizon than is defined as the range for the series. This difference does not significantly alter the use or behavior of these soils.

Gerald soils are adjacent to Fourche and Nicholson soils. Fourche soils do not have a fragipan and are on somewhat lower positions than or on positions similar to those of Gerald soils. Nicholson soils are less clayey, not so gray as Gerald soils, and are on similar positions.

Typical pedon of Gerald silt loam, 1 to 4 percent slopes; in a pasture, 1,300 feet north and 1,950 feet west of the southeast corner sec. 32, T. 37 N., R. 6 E.; UTM coordinates 4,194,260 meters N. and 729,630 meters E.

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate very fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

E—10 to 13 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct brown (7.5YR 4/4) mottles; weak fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.

E/B—13 to 18 inches; dark grayish brown (10YR 4/2) silt loam (E) coatings and dark reddish brown (2.5YR 3/4) silty clay (B); strong very fine subangular blocky structure; firm; common fine roots; few distinct clay films; strongly acid; clear smooth boundary.

Bt1—18 to 23 inches; dark gray (10YR 4/1) clay; common distinct dark reddish brown (2.5YR 3/4) mottles; strong fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common distinct clay films; strongly acid; clear smooth boundary.

Btg—23 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; continuous grayish brown (10YR 5/2) coatings on faces of peds; few fine prominent reddish brown (2.5YR 5/4) mottles; weak fine subangular blocky structure; firm, about 40 percent brittle; common fine roots; common distinct brown (7.5YR 4/2) clay films; strongly acid; clear smooth boundary.

Bx—29 to 53 inches; yellowish brown (10YR 5/4) silt loam; few medium distinct grayish brown (10YR 5/2) mottles; massive except for very coarse prisms; very hard, brittle; few roots; few prominent clay films along vertical faces of prisms; strongly acid; gradual smooth boundary.

2Bt2—53 to 60 inches; yellowish brown (10YR 5/4) clay; common fine distinct light brownish gray (2.5Y 5/2) mottles; very firm; moderate medium angular blocky structure; few distinct slickensides; common distinct clay films; few black concretions; mildly alkaline.

The thickness of the solum is more than 60 inches, and depth to the fragipan ranges from about 20 to 30 inches.

The A or Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The E horizon has value of 4 or 5 and chroma of 2. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 1 or 2 in the upper part and 2 to 4 in lower part. It has mottles that have hue of 5YR, 2.5YR, or 10R, value of 3 to 5, and chroma of 4 to 6. The Bt horizon commonly is strongly acid or very strongly acid. The Bx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It has mottles that have hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 or 2. The 2B horizon ranges from silty clay loam to clay and has colors similar to those of the Bx horizon.

Goss Series

The Goss series consists of deep, well drained soils on upland side slopes of the deeply dissected Salem Plateau. These soils formed in cherty residuum or other red, clayey material. Permeability is moderate. Slope ranges from 14 to about 45 percent.

Goss soils are adjacent to Gasconade, Hildebrecht, Menfro, Weingarten, and Wilderness soils on the uplands and Bloomsdale and Midco soils on the bottom lands. Gasconade soils are shallow to bedrock and are on positions similar to those of the Goss soils. Hildebrecht and Wilderness soils have a fragipan, contain less clay, and are on ridges and side slopes above Goss soils in the landscape. Menfro soils are on similar positions, have less clay, and do not have chert. Weingarten soils do not have chert fragments in the upper 40 inches and are on slopes above Goss soils. Bloomsdale and Midco soils contain less clay and are browner.

Typical pedon of Goss cherty silt loam, 14 to 35 percent slopes; on a southeast wooded slope, 1,750 feet

west and 1,300 feet north of the southeast corner sec. 8, T. 36 N., R. 8 E.; UTM coordinates 4,191,150 meters N. and 748,830 meters E.

A—0 to 3 inches; dark brown (10YR 4/3) cherty silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine and medium roots; about 33 percent chert fragments—23 percent less than 3 inches in diameter, 10 percent 3 to 10 inches; medium acid; clear smooth boundary.

E—3 to 10 inches; brown (7.5YR 5/3) very cherty silt loam, very pale brown (10YR 7/3) dry; weak thin platy structure parting to weak fine granular; friable; common fine and coarse roots; 50 percent chert fragments—about 40 percent less than 3 inches in diameter, 10 percent 3 to 10 inches; strongly acid; clear smooth boundary.

Bt1—10 to 14 inches; yellowish red (5YR 4/6) very cherty silty clay loam; moderate very fine subangular blocky structure; friable; common fine roots; 60 percent chert fragments—45 percent less than 3 inches in diameter, 15 percent more than 3 inches of which a few are more than 10 inches; strongly acid; clear wavy boundary.

Bt2—14 to 26 inches; dark red (2.5YR 3/6) very cherty clay; strong very fine subangular blocky structure; firm; common fine and coarse roots; common faint clay films; 60 percent chert fragments—50 percent less than 3 inches in diameter, 10 percent more than 3 inches; strongly acid; gradual wavy boundary.

Bt3—26 to 38 inches; dark red (10R 3/6) very cherty clay; moderate fine subangular blocky structure; very firm; few fine and medium roots; common faint clay films; 40 percent chert fragments mostly less than 3 inches in diameter; medium acid; gradual wavy boundary.

Bt4—38 to 60 inches; dusky red (10R 3/4) cherty clay; moderate fine and very fine subangular blocky structure; very firm; few fine roots; common distinct clay films; common fine distinct black stains; 25 percent chert fragments mostly less than 3 inches in diameter; neutral.

The thickness of the solum ranges from 60 inches to 100 inches or more. The depth to bedrock commonly is 10 feet or more.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4. It commonly ranges from neutral to strongly acid. The A horizon ranges from 15 to about 25 percent chert. The E horizon is commonly neutral to strongly acid, but in some pedons it is very strongly acid. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It ranges from 15 to about 50 percent chert.

The Bt1 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is very cherty silty clay loam or extremely cherty silty clay loam. The Bt1 horizon generally ranges from slightly acid to strongly acid; rarely it is very strongly acid. The Bt2 horizon and the material below this horizon have hue of 5YR through 10R, value of 3 or 4, and chroma of 4 to 8. Texture is very cherty or cherty analogues of clay or silty clay. The Bt2 horizon ranges from neutral to strongly acid. Chert content of the B horizon ranges from 25 to about 75 percent.

Haymond Series

The Haymond series consists of deep, well drained soils on flood plains. These soils formed in silty alluvium along the rivers, creeks, and larger branch bottoms. Permeability is moderate. Slope ranges from 0 to 2 percent.

Haymond soils are similar to Wilbur soils and commonly are adjacent to Ashton, Bloomsdale, and Wilbur soils. Ashton soils are on terraces 10 to 20 feet higher in elevation than Haymond soils and have a B horizon. Bloomsdale soils are closer to the small stream channels and contain more than 35 percent chert gravel in the 10- to 40-inch control section. Wilbur soils have mottles of 2 chroma in the upper 20 inches of the solum.

Typical pedon of Haymond silt loam; in bermudagrass sod, about 1,900 feet south and 50 feet east of the northwest corner sec. 21, T. 38 N., R. 9 E.; UTM coordinates 4,208,260 meters N. and 758,650 meters E.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

AC—9 to 23 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; common very fine roots; about 10 percent earthworm holes and casts; neutral; clear smooth boundary.

C1—23 to 30 inches; yellowish brown (10YR 5/4) silt loam; massive; very friable; common very fine roots; about 5 percent earthworm holes and casts; neutral; clear smooth boundary.

C2—30 to 43 inches; dark brown (10YR 4/3) silt loam; massive; very friable; common very fine roots; 25 percent earthworm holes and casts; mildly alkaline; clear smooth boundary.

C3—43 to 59 inches; brown (10YR 4/3) silt loam; massive; very friable; few very fine roots; mildly alkaline; gradual smooth boundary.

C4—59 to 72 inches; brown (10YR 5/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; massive; friable; stratified with few thin lenses of sandy loam; mildly alkaline.

The depth to bedrock is more than 60 inches. Reaction is neutral or mildly alkaline.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Dry value is 6 or more. The AC horizon has the same colors as the A horizon. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Thin strata of sandy loam or loam are common below a depth of 30 inches. A 2C horizon is present in some pedons below a depth of 40 inches. It is loam, sandy loam, or gravelly analogues of these textures. The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6.

Haynie Series

The Haynie series consists of deep, moderately well drained soils on the Mississippi River flood plain. These soils formed in silty and loamy alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Haynie soils commonly are adjacent to Beaucoup, Carr, Nameoki, and Wabash soils in the landscape. Beaucoup, Nameoki, and Wabash soils have a mollic epipedon, have more clay than Haynie soils, and are on slightly lower positions. Carr soils contain more than 15 percent fine sand or coarser and are on positions similar to those of Haynie soils.

Typical pedon of Haynie silt loam; 1,200 feet south and 400 feet east of the northwest corner sec. 26, T. 38 N., R. 9 E.; UTM coordinates 4,206,650 meters N. and 762,090 meters E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; common fine roots; weak effervescence; mildly alkaline; abrupt smooth boundary.

C1—9 to 35 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark brown (10YR 3/3) mottles; weak fine granular structure; friable; few fine roots; few worm casts in the upper part; strong effervescence; mildly alkaline; clear smooth boundary.

C2—35 to 41 inches; brown (10YR 5/3) very fine sandy loam; few fine distinct dark brown (7.5YR 4/4) mottles; massive; very friable; few fine roots; strong effervescence; mildly alkaline; abrupt smooth boundary.

C3—41 to 48 inches; dark grayish brown (10YR 4/2) silt loam; massive; very friable; few fine roots; strong effervescence; mildly alkaline; abrupt smooth boundary.

C4—48 to 60 inches; grayish brown (10YR 5/2) very fine sandy loam; few thin strata of dark grayish brown (10YR 4/2) silt loam; massive; very friable; strong effervescence; mildly alkaline.

The thickness of the solum is less than 10 inches and commonly corresponds to the thickness of the A horizon. The depth to free carbonates ranges from 0 to 10 inches. Free carbonates are present throughout the 10- to 40-inch control section.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It typically is silt loam, very fine sandy loam, or loam throughout but in some pedons contains strata of fine sandy loam or loamy fine sand or lenses of silty clay loam.

Hildebrecht Series

The Hildebrecht series consists of deep, moderately well drained soils on upland ridges and foot slopes. These soils formed in thin loess and residuum or other cherty clayey material. Permeability is moderate above the fragipan and slow in the fragipan. Slope ranges from 3 to 14 percent.

Hildebrecht soils are similar to Jonca, Nicholson, and Union soils and are adjacent to Goss, Weingarten, and Wilderness soils in the landscape. Jonca soils contain more sand in the fragipan and underlying material than Hildebrecht soils. Nicholson soils do not have chert in the fragipan. Goss soils do not have a fragipan and are on slopes below Hildebrecht soils. Union soils average more than 35 percent clay in the Bt horizon above the fragipan. Weingarten soils do not have a fragipan and are on positions similar to those of Hildebrecht soils. Wilderness soils contain chert throughout the solum and are on lower, narrower ridgetops and side slopes.

Typical pedon of Hildebrecht silt loam, 3 to 9 percent slopes; in a pasture, 1,300 feet south and 800 feet east of the northwest corner sec. 20, T. 35 N., R. 9 E.; UTM coordinates 4,179,240 meters N. and 758,260 meters E.

Ap—0 to 3 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

E—3 to 7 inches; brown (7.5YR 5/4) silt loam; weak fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt1—7 to 16 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films; very strongly acid; gradual smooth boundary.

Bt2—16 to 24 inches; strong brown (7.5YR 5/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; common fine roots; few faint clay films; very strongly acid; gradual smooth boundary.

Bt3—24 to 31 inches; strong brown (7.5YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films; 5 percent chert fragments; very strongly acid; gradual smooth boundary.

Bt4—31 to 38 inches; brown (7.5YR 4/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; few faint clay films; 6 percent chert fragments; extremely acid; abrupt wavy boundary.

2Ex—38 to 47 inches; strong brown (7.5YR 5/4) extremely cherty silt loam; massive; extremely hard, brittle; light gray (10YR 7/2) silt loam along very coarse prisms; 70 percent fine chert fragments; extremely acid; clear wavy boundary.

2Bx—47 to 59 inches; brown (7.5YR 4/4) extremely cherty silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; massive; extremely hard, brittle; 70 percent chert fragments; very strongly acid; clear wavy boundary.

2Bt5—59 to 75 inches; dark red (2.5YR 3/6) very cherty clay; common medium distinct strong brown (7.5YR 5/6) mottles; moderate fine and very fine subangular blocky structure; firm; few distinct clay films; 60 percent chert fragments; medium acid; clear wavy boundary.

The thickness of the solum is more than 60 inches. Depth to the fragipan ranges from 25 to 40 inches. Thickness of the fragipan ranges from 12 to 28 inches. Chert content in the fragipan ranges from 15 to 75 percent and below the fragipan, it ranges from 15 to 60 percent.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 4. The A and E horizons range from medium acid to neutral. The Bt horizon has hue of 7.5YR and rarely 10YR, value of 4 or 5, and chroma of 4 to 6. The fragipan, or 2Ex and 2Bx horizons, has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The fragipan and the Bt horizon range from extremely acid to strongly acid. The 2Bt horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 6. It ranges from medium acid to strongly acid.

Jonca Series

The Jonca series consists of deep, moderately well drained soils on upland ridges. These soils formed in thin loess and loamy residuum. Permeability is moderate above the fragipan and slow in the fragipan. Slope ranges from 3 to 9 percent.

Jonca soils are similar to Hildebrecht, Nicholson, and Union soils and commonly are adjacent to Lamotte, Lily, and Ramsey soils. Hildebrecht, Nicholson, and Union soils contain less sand throughout the solum than Jonca soils and are on similar positions. Lamotte, Lily, and Ramsey soils do not have a fragipan and are on side slopes below Jonca soils. Hard sandstone is at a depth of less than 40 inches in the Lily and Ramsey soils.

Typical pedon of Jonca silt loam, 3 to 9 percent slopes; in a fescue pasture, 2,000 feet north and 1,400 feet west of the southeast corner sec. 24, T. 36 N., R. 6 E.; UTM coordinates 4,187,890 meters N. and 736,530 meters E.

Ap—0 to 5 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

E—5 to 12 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—12 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; few faint clay films; strongly acid; gradual smooth boundary.

Bt2—18 to 32 inches; strong brown (7.5YR 5/6) silty clay loam; weak fine subangular blocky structure; firm; common fine roots; few faint clay films; very strongly acid; clear smooth boundary.

2Bx1—32 to 40 inches; yellowish brown (10YR 5/4) loam; moderate coarse prismatic structure, massive interiors; very hard, brittle; few distinct clay films; very strongly acid; abrupt smooth boundary.

2Bx2—40 to 52 inches; yellowish brown (10YR 5/4) loam; many coarse distinct light brownish gray (10YR 6/2) and dark yellowish brown (10YR 3/4) mottles; weak very coarse prismatic structure, massive interiors; very hard, brittle; few distinct clay films along prism faces; very strongly acid; abrupt smooth boundary.

2Bt3—52 to 62 inches; yellowish red (5YR 5/6) clay loam; weak fine subangular blocky structure; hard, moderately brittle; few distinct clay films; 25 percent soft sandstone fragments; very strongly acid; clear irregular boundary.

R—62 inches; hard sandstone.

The thickness of the solum ranges from 52 to about 72 inches, and the depth to bedrock ranges from 60 to about 100 inches. Depth to the fragipan in noneroded soils commonly ranges from 30 to 38 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It ranges from medium acid to neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It commonly is silty clay loam, but in some pedons it is clay loam in the lower part. The Bt horizon commonly is strongly acid or very strongly acid. The fragipan has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It commonly has mottles of 2 chroma. The fragipan is loam or clay loam. The 2B horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 8. The fragipan and material below the fragipan commonly are very strongly acid or extremely acid.

Lamotte Series

The Lamotte series consists of deep, well drained soils on upland side slopes and ridgetops. These soils formed in a thin layer of loess and in loamy residuum. Permeability is moderate. Slope ranges from 5 to 14 percent.

Lamotte soils are similar to Crider soils and commonly are adjacent to Jonca, Lily, and Ramsey soils in the landscape. Crider soils have less sand than Lamotte soils. Jonca soils have a fragipan and are on ridges above Lamotte soils. Lily and Ramsey soils are less than 40 inches in depth to hard sandstone. Lily soils are on similar slopes, and Ramsey soils are on steep positions at lower elevations than Lamotte soils.

Typical pedon of Lamotte silt loam, 5 to 9 percent slopes; in a tall fescue pasture, 1,300 feet north and 200 feet west of the southeast corner sec. 32, T. 37 N., R. 6 E.; UTM coordinates 4,194,330 meters N. and 730,180 meters E.

A—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many very fine roots; neutral; clear smooth boundary.

E—6 to 11 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many very fine roots; slightly acid; clear wavy boundary.

Bt1—11 to 18 inches; yellowish red (5YR 4/6) clay loam; moderate very fine subangular blocky structure; friable; common fine roots; few faint clay films; medium acid; clear wavy boundary.

Bt2—18 to 32 inches; yellowish red (5YR 4/6) clay loam; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films; medium acid; clear smooth boundary.

Bt3—32 to 52 inches; dark red (2.5YR 3/6) clay loam; weak fine subangular blocky structure; firm; common fine roots; few distinct clay films; very strongly acid; gradual smooth boundary.

C—52 to 64 inches; dark red (2.5YR 3/6) clay loam; weak medium subangular blocky structure; firm; few fine roots; about 10 percent pebbles and soft sandstone fragments; extremely acid.

The thickness of the solum ranges from 48 to about 72 inches. Depth to hard rock ranges from 60 to about 100 inches.

The Ap or A horizon has value of 4 and chroma of 2 or 3. The A2 horizon has value of 4 or 5 and chroma of 3 to 4. It ranges from medium acid to neutral. The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 to 6. It ranges from medium acid to extremely acid.

Lily Series

The Lily series consists of moderately deep, well drained soils on upland side slopes. These soils formed in loamy residuum. Permeability is moderately rapid. Slope ranges from 9 to 14 percent.

Lily soils are adjacent to Jonca, Lamotte, and Ramsey soils in the landscape. Jonca soils are on convex ridgetops at higher elevations. They are deep, have a fragipan, and contain less sand in the upper part of the subsoil than Lily soils. Lamotte soils are more than 60 inches in depth to hard bedrock and are on positions similar to those of Lily soils. Ramsey soils are shallow to bedrock and commonly are on steeper positions at a lower elevation. They contain stones and gravel throughout.

Typical pedon of Lily loam, 9 to 14 percent slopes; in a small woodlot of mixed hardwoods, 2,500 feet east and 2,600 feet south of the northwest corner sec. 9, T. 37 N., R. 6 E.; UTM coordinates 4,194,330 meters N. and 730,180 meters E.

A—0 to 4 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

E—4 to 9 inches; yellowish brown (10YR 5/4) loam; weak fine granular structure; very friable; common fine roots; medium acid; clear wavy boundary.

Bt1—9 to 13 inches; brown (7.5YR 4/4) loam; strong very fine subangular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt2—13 to 24 inches; strong brown (7.5YR 5/6) clay loam; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films; strongly acid; clear smooth boundary.

Bt3—24 to 31 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; very firm; common fine roots; common distinct clay films; few pebbles; very strongly acid; abrupt wavy boundary.

R—31 inches; hard sandstone.

The thickness of the solum and the depth to sandstone range from 20 to 40 inches. Coarse fragments of sandstone commonly range from 0 to 10 percent throughout, but as much as 25 percent is in the B3 horizon in some pedons.

The A or Ap horizon has value of 3 or 4 and chroma of 2 or 4. It ranges from strongly acid to neutral. The Bt horizon has hue of 7.5YR, 10YR, or 5YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam, loam, or sandy clay loam and averages between 28 and 35 percent clay content. The B horizon ranges from medium acid to very strongly acid in the upper part and from strongly acid to extremely acid in the lower part.

Menfro Series

The Menfro series consists of deep, well drained soils on uplands. These soils formed in silty loess deposits 6 to 20 feet thick. Permeability is moderate. Slope ranges from 2 to 35 percent.

Menfro soils are similar to Crider, Minnith, and Weingarten soils and are adjacent to Gasconade, Goss, and Haymond soils. Crider soils are redder and contain

more clay in the lower part of the subsoil than Menfro soils. Gasconade soils are darker and are shallower to limestone or dolomite. Goss soils have a red cherty clay subsoil. Gasconade and Goss soils are lower on side slopes or are on positions similar to those of Menfro soils. Haymond soils are silty, do not have a B horizon, and are on flood plains. Minnith soils have mottles of 2 chroma and contain more sand in the 2B horizon. Weingarten soils have a 2B horizon and have more clay at a depth of 40 to 60 inches.

Typical pedon of Menfro silt loam, 3 to 9 percent slopes; on the Ste. Genevieve Fairground, 400 feet north and 400 feet east of the southwest corner sec. 16, T. 38 N., R. 9 E.; UTM coordinates 4,208,910 meters N. and 758,710 meters E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 14 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

Bt2—14 to 21 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; slightly acid; thin nearly continuous silt coatings; few faint clay films; strongly acid; clear smooth boundary.

Bt3—21 to 42 inches; brown (7.5YR 4/4) silty clay loam; strong medium subangular blocky structure; firm; few thin silt coatings on faces of peds; common faint clay films; common fine roots; strongly acid; gradual smooth boundary.

Bt4—42 to 52 inches; brown (7.5YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; few faint clay films; slightly acid; diffuse boundary.

C—52 to 72 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; few old tree roots and channels; few faint clay films on walls of vertical cracks; neutral.

The thickness of the solum commonly is 40 to 60 inches but ranges from 30 to 72 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Bt horizon has hue of 7.5YR and rarely 10YR, value of 4, and chroma of 3 or 4. Clay content of the upper 20 inches of the Bt horizon averages between 27 and 32 percent. The Bt horizon ranges from strongly acid to neutral. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is slightly acid or neutral.

Midco Series

The Midco series consists of deep, somewhat excessively drained soils on narrow flood plains. These soils formed in cherty alluvium washed from adjacent uplands. Permeability is moderately rapid. Slope ranges from 1 to 3 percent.

Midco soils are similar to Bloomsdale soils and commonly are adjacent to Bloomsdale and Goss soils in the landscape. Bloomsdale soils are on positions similar to those of Midco soils, are more silty in the upper 18 inches, and contain less sand. Goss soils have a B horizon that has more clay and are on upland side slopes.

Typical pedon of Midco cherty silt loam, 1 to 3 percent slopes; in a mixed hardwood forest, 700 feet south and 1,980 feet east of the northwest corner sec. 15, T. 38 N., R. 6 E.; UTM coordinates 4,210,170 meters N. and 732,210 meters E.

A—0 to 6 inches; dark brown (10YR 4/3) cherty silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; 20 percent chert fragments; neutral; abrupt smooth boundary.

C1—6 to 11 inches; dark yellowish brown (10YR 4/4) cherty silt loam; moderate fine granular structure; friable; common fine roots; 35 percent chert fragments; slightly acid; abrupt wavy boundary.

C2—11 to 16 inches; brown (7.5YR 5/4) very cherty loam; weak fine granular structure; very friable; common medium roots; 40 percent chert fragments; medium acid; abrupt smooth boundary.

C3—16 to 24 inches; brown (7.5YR 4/4) very cherty sandy loam; weak fine granular structure and single grain; very friable and loose; common medium roots; 60 percent chert fragments—50 percent less than 3 inches in diameter, 10 percent 3 to 10 inches; slightly acid; clear smooth boundary.

C4—24 to 44 inches; dark brown (7.5YR 4/4) extremely cherty sandy loam; single grain; very friable; common medium roots; 75 percent chert fragments—65 percent less than 3 inches in diameter, 10 percent 3 to 10 inches; neutral; clear smooth boundary.

C5—44 to 63 inches; dark yellowish brown (10YR 4/4) extremely cherty loam; massive; friable; common medium roots; 70 percent chert fragments—50 percent less than 3 inches in diameter, 20 percent 3 to 10 inches; neutral.

The thickness of the solum ranges from 4 to 10 inches and corresponds with the thickness of the A horizon. Chert content in the solum ranges from 25 to 70 percent; of this, coarse chert is 5 to about 25 percent.

The A horizon has value of 3 or 4 and chroma of 2 or 3. It is slightly acid or neutral. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from strongly acid to neutral.

Minnith Series

The Minnith series consists of deep, moderately well drained soils on upland side slopes and ridgetops. These soils formed in loess and loamy residuum. Permeability is moderately slow. Slope ranges from 3 to 14 percent.

Minnith soils are similar to Menfro and Weingarten soils and commonly are adjacent to Goss, Lily, Menfro, and Ramsey soils in the landscape. Goss soils have a red clayey subsoil, are cherty throughout, and are lower on side slopes than Minnith soils. Lily soils are moderately deep to sandstone, and Ramsey soils are shallow over hard sandstone. Lily and Ramsey soils are higher on side slopes. Menfro soils do not have a 2B horizon. Weingarten soils contain less sand, have redder hue, are more clayey in the 2B and 2C horizons, and are on higher positions.

Typical pedon of Minnith silt loam, 9 to 14 percent slopes; in a fescue pasture, 1,400 feet south and 950 feet west of the northeast corner sec. 15, T. 36 N., R. 9 E.; UTM coordinates 4,190,540 meters N. and 762,150 meters E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak thin platy structure parting to moderate fine and very fine granular; slightly hard, friable; many fine and very fine roots; neutral; clear smooth boundary.

E—7 to 12 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; common fine and very fine roots; slightly acid; clear smooth boundary.

BE—12 to 18 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/4) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable; common fine and very fine roots; medium acid; clear smooth boundary.

Bt1—18 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine and very fine roots; common faint patchy clay films; common thin silt coatings; strongly acid; clear smooth boundary.

Bt2—24 to 34 inches; dark yellowish brown (10YR 4/4) silty clay loam; common faint yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine and fine roots; common distinct clay films; common thin silt coatings; very strongly acid; gradual smooth boundary.

2Bt3—34 to 48 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; firm; few very fine roots; few distinct clay films; very strongly acid; gradual smooth boundary.

2BC—48 to 59 inches; yellowish brown (10YR 5/4) loam; common coarse distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; few faint clay films; strongly acid; gradual smooth boundary.

2C—59 to 85 inches; strong brown (7.5YR 5/6) loam; common medium faint pinkish gray (7.5YR 6/2) mottles; massive except for few vertical faces; firm; few very fine roots; few faint dark brown clay flows; common black stains; medium acid; abrupt wavy boundary.

R—85 inches; hard sandstone.

The thickness of the solum ranges from 48 to 62 inches. Depth to sandstone bedrock ranges from 60 to 100 inches or more.

The Ap or A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is slightly acid or neutral. The E horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from strongly acid to slightly acid, unless limed.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It ranges from very strongly acid to neutral. The 2B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It is clay loam, loam, silt loam, and rarely sandy clay loam. It has mottles that have value of 5 or 6 and chroma of 2 or less. The 2B horizon ranges from very strongly acid to slightly acid.

The 2C horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, sandy clay loam, or sandy loam. It commonly has mottles that have value of 5 to 7 and chroma of 3 or less. The 2C horizon ranges from strongly acid to neutral.

Nameoki Series

The Nameoki series consists of deep, somewhat poorly drained soils on the Mississippi River flood plain. These soils formed in mixed alluvium underlain by loamy sediment (fig. 20). Permeability is very slow. Slope ranges from 0 to 2 percent.

Nameoki soils are similar to Wabash soils and commonly are adjacent to Beaucoup, Haynie, and Wabash soils on the flood plain. Beaucoup soils have less clay and are on positions similar to those of Nameoki soils. Haynie soils have less clay and are on higher positions. Wabash soils do not have loamy textures within a depth of 40 inches.

Typical pedon of Nameoki silty clay loam; in a cultivated field, 2,500 feet north and 100 feet east of the southwest corner sec. 35, T. 38 N., R. 9 E; UTM coordinates 4,206,090 meters N. and 762,660 meters E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; firm; common fine roots; mildly alkaline; clear smooth boundary.

Figure 20.—Profile of Nameoki silty clay loam. The subsoil is clayey in the upper part. Loamy textures start at a depth of about 30 inches. The scale is in feet.

A—9 to 15 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; moderate fine and medium subangular blocky structure; firm; many very fine roots; mildly alkaline; clear smooth boundary.

Bg1—15 to 22 inches; dark gray (10YR 4/2) silty clay; some dark gray (10YR 4/1) coatings; weak coarse columnar structure parting to moderate medium subangular blocky; very firm; many very fine roots; few slickensides and pressure faces; mildly alkaline; clear smooth boundary.

Bg2—22 to 30 inches; dark grayish brown (2.5Y 4/2) silty clay; weak coarse columnar structure parting to weak coarse subangular blocky; very firm; common very fine roots; slickensides; mildly alkaline; clear smooth boundary.

2Bg3—30 to 35 inches; dark grayish brown (10YR 4/2) clay loam; weak medium subangular blocky structure; friable; few fine roots; mildly alkaline; weak effervescence; clear smooth boundary.

2B4—35 to 52 inches; grayish brown (10YR 5/2) silt loam; massive; very friable; few to common very fine roots; mildly alkaline; strong effervescence; abrupt smooth boundary.

3C—52 to 70 inches; grayish brown (10YR 5/2) sand; single grain; loose; mildly alkaline; strong effervescence.

The thickness of the mollic epipedon ranges from 12 to about 20 inches. Thickness of the clayey material ranges from 24 to 36 inches, and thickness of the solum commonly ranges from 40 to 60 inches. The solum ranges from slightly acid to mildly alkaline throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Dry value is 4 or 5. The A horizon is silty clay loam or silty clay. The mollic epipedon commonly extends into the B horizon. The B horizon has hue of 2.5Y or 10YR, value of 3 or 4, and chroma of 2 or 3. It is silty clay loam, clay loam, silty clay, or clay. The 2C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is silt loam, loam, very fine sandy loam, fine sandy loam, or very fine sand.

Nicholson Series

The Nicholson series consists of deep, moderately well drained soils on upland ridgetops and side slopes. These soils formed in loess and residuum or other clayey materials. Permeability is moderate above the fragipan and slow in the fragipan. Slope ranges from about 3 to 9 percent.

The Nicholson soils in Ste. Genevieve County differ from the series by having mottles in the upper 10 inches of the Bt horizon. This difference does not significantly alter the use and behavior of these soils.

Nicholson soils are similar to Hildebrecht, Jonca, and Union soils and commonly are adjacent to Crider, Fourche, and Gerald soils. Crider and Fourche soils do not have a fragipan. Crider soils are well drained, are brown and red throughout, and are on positions similar to those of Nicholson soils. Gerald soils have more clay

above the fragipan and are on similar positions. Hildebrecht and Union soils have more chert in the lower part of the subsoil; Union soils have more clay. Jonca soils have more sand in the lower part of the subsoil.

Typical pedon of Nicholson silt loam, 3 to 9 percent slopes; in a weedy pasture, 2,000 feet west of the southeast corner sec. 16, T. 36 N., R. 6 E.; UTM coordinates 4,189,710 meters N. and 731,350 meters E.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

E—5 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; common very fine roots; slightly acid; abrupt wavy boundary.

BE—8 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common very fine roots; strongly acid; abrupt wavy boundary.

Bt1—14 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; thin pale brown (10YR 6/3) silt coatings, white (10YR 8/2) dry; strong fine subangular blocky structure; firm; common very fine roots; few faint clay films; very strongly acid; gradual smooth boundary.

Bt2—21 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; many fine distinct dark grayish brown (10YR 4/2) mottles; few thin pale brown (10YR 6/3) silt coatings, white (10YR 8/2) dry; moderate medium subangular blocky structure; firm; common very fine roots; common distinct clay films; very strongly acid; clear smooth boundary.

Bx—25 to 51 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles and vertical streaks; weak very coarse prismatic structure, massive interior; very firm, brittle; common fine pores; few distinct clay films; very strongly acid; gradual smooth boundary.

2Bt3—51 to 68 inches; yellowish brown (10YR 5/6) silty clay; few fine prominent dark red (2.5YR 3/6) mottles; weak fine angular blocky structure; very firm; few distinct clay films; common black stains and concretions; slickensides; slightly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Depth to the fragipan commonly ranges from 25 to 30 inches.

The A horizon commonly has value of 4, but ranges to value of 3 where unplowed, and chroma of 2 to 4. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It ranges from very strongly acid to medium acid. The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is very strongly acid or strongly acid. The Bx horizon commonly is silt loam but ranges to silty clay loam. The 2Bt horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It commonly has mottles with chroma of 2 in the Bx and 2Bt horizons. The 2Bt horizon ranges from strongly acid to neutral.

Ramsey Series

The Ramsey series consists of shallow, somewhat excessively drained soils on upland side slopes and escarpments. These soils formed in loamy residuum derived from sandstone. Permeability is rapid. Slope ranges from 14 to 35 percent.

Ramsey soils commonly are adjacent to Jonca, Lily, and Minnith soils. Jonca and Minnith soils are deep to bedrock and are on less sloping positions. In addition, Jonca soils have a fragipan. Lily soils are moderately deep to bedrock and are on less sloping positions, commonly at higher elevations than Ramsey soils.

Typical pedon of Ramsey stony loam, 14 to 35 percent slopes; in a shortleaf pine and oak forest, 1,150 feet south and 800 feet east of the northwest corner sec. 14, T. 36 N., R. 7 E.; UTM coordinates 4,190,220 meters N. and 743,430 meters E.

O1—1 inch to 0; partly decomposed litter of pine needles and oak leaves.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) stony loam; moderate fine granular structure; very friable; many fine roots; 9 percent gravel, 10 percent cobbles and stones; slightly acid; abrupt smooth boundary.

E—3 to 7 inches; brown (10YR 4/3) loam; weak fine granular structure; friable; common medium roots; 12 percent gravel, 18 percent cobbles and stones; slightly acid; clear wavy boundary.

Bw—7 to 15 inches; yellowish brown (10YR 5/4) loam; weak fine subangular structure; friable; common medium roots; 16 percent gravel, 15 percent cobbles and stones; strongly acid; abrupt wavy boundary.

R—15 inches; hard sandstone; 10 percent strong brown (7.5YR 5/6) loam in narrow fractures.

The thickness of the solum and the depth to bedrock range from about 7 to 20 inches. Coarse fragments of sandstone range from a trace to 35 percent by volume. Sandstones, 15 to 24 inches long, range from an occasional fragment to about 15 percent of the surface.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 3 or 4. The A horizon is very strongly acid to slightly acid. The B horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is loam or sandy loam or the gravelly or cobbly analogues of these textures. The B horizon is very strongly acid or strongly acid.

Ross Series

The Ross series consists of deep, well drained soils on flood plains along tributaries of the Mississippi River. These soils formed in loamy and silty alluvium washed from upland soils that formed in sandstone and limestone residuum and loess. Permeability is moderate. Slopes are slightly convex and range from 0 to 2 percent.

Ross soils commonly are adjacent to Bloomsdale and Haymond soils in the landscape. Bloomsdale soils have a cherty substratum and are upstream or closer to the channel than Ross soils. Haymond soils do not have a mollic epipedon and are stratified. These soils are on positions similar to those of Ross soils.

Typical pedon of Ross silt loam; in a cultivated field, 2,475 feet west and 300 feet south of the northeast corner sec. 34, T. 37 N., R. 8 E.; UTM coordinates 4,195,490 meters N. and 751,700 meters E.

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; very friable; common very fine roots; neutral; clear smooth boundary.

Bw—10 to 30 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) rubbed, grayish brown (10YR 5/2) dry; moderate medium prismatic structure parting to weak fine and medium subangular blocky; friable; common very fine roots; few pores; few worm casts; neutral; gradual wavy boundary.

C1—30 to 52 inches; dark brown (10YR 4/3) silt loam; weak fine and very fine subangular blocky structure; friable; common very fine roots; neutral; gradual smooth boundary.

C—52 to 66 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct dark brown (7.5YR 3/2) mottles; weak coarse granular structure; friable; few fine roots; neutral.

The thickness of the solum and mollic epipedon ranges from about 24 to 40 inches. The solum ranges from slightly acid to mildly alkaline throughout.

The A horizon has value of 3 and chroma of 2 or 3. The B horizon has colors similar to those of the A horizon. It is silt loam or loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam, loam, or sandy loam. It is stratified in many pedons.

Syenite Series

The Syenite series consists of moderately deep, well drained soils on upland side slopes bordering the Fourche a du Clou, Jonca, and Pickle creeks. These soils formed in loamy material weathered from granite and similar igneous rock. Permeability is moderately slow. Slope ranges from 14 to about 35 percent.

The Syenite soils in Ste. Genevieve County have a paralithic contact at a depth between 20 and 40 inches. Because of this they differ from the series, but this difference does not significantly affect the use and behavior of these soils.

Syenite soils commonly are adjacent to Jonca, Lily, and Ramsey soils. Jonca soils are deep and have a fragipan. Lily soils are not stony and have more sand. Jonca and Lily soils are on less sloping positions at higher elevations than Syenite soils. Ramsey soils are shallow to sandstone bedrock and are on similar and higher positions.

Typical pedon of Syenite very bouldery silt loam, 14 to 35 percent slopes; in oak-pine forest, 1,150 feet east and 950 feet south of the northwest corner sec. 22, T. 36 N., R. 7 E.; UTM coordinates 4,188,690 meters N. and 741,990 meters E.

A—0 to 4 inches; dark brown (10YR 3/3) very bouldery silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—4 to 9 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.

BE—9 to 14 inches; strong brown (7.5YR 5/6) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; about 10 percent fine gravel; strongly acid; clear wavy boundary.

Bt1—14 to 25 inches; brown (7.5YR 4/4) loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; common fine roots; few distinct clay films; about 15 percent fine gravel; very strongly acid; gradual wavy boundary.

Bt2—25 to 36 inches; brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films; about 20 percent fine gravel; extremely acid; clear wavy boundary.

Cr—36 to 55 inches; weathered granite; weakly bedded; very hard; abrupt wavy boundary.

R—55 inches; hard red granite.

The thickness of the solum ranges from 26 to about 40 inches. Depth to weathered bedrock ranges from 40 to about 60 inches. Boulders and stones cover 3 to 15 percent of the surface.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The dry value is 6 or more. The E horizon has value of 4 or 5 and chroma of 3 or 4. It ranges from medium acid to slightly acid. In most pedons, the A and E horizons do not have coarse fragments, but in some pedons these horizons have less than 5 percent coarse fragments. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loam, clay loam, sandy clay loam, sandy loam, and rarely silty clay

loam or silt loam. The Bt horizon ranges from strongly acid in the upper part to extremely acid in the lower part. Coarse fragments, mostly gravel, range from 5 to 15 percent.

Union Series

The Union series consists of deep, moderately well drained soils on high upland ridges. These soils formed in thin loess and residuum or other cherty materials. They have a fragipan at a depth of 27 to 40 inches. Permeability is slow. Slope ranges from 3 to 9 percent.

Union soils are similar to Hildebrecht, Jonca, and Nicholson soils and commonly are adjacent to Wilderness soils in the landscape. All these soils contain less clay than Union soils. Jonca soils contain more sand. Wilderness soils contain chert throughout the solum and are lower on side slopes than Union soils.

Typical pedon of Union silt loam, 3 to 9 percent slopes; in a young stand of shortleaf pine, 1,200 feet east and 550 feet south of the northwest corner sec. 24, T. 35 N., R. 8 E.; UTM coordinates 4,179,410 meters N. and 755,000 meters E.

A—0 to 4 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; slightly acid; clear wavy boundary.

E—4 to 7 inches; brown (10YR 5/4) silt loam; weak fine granular structure; friable; many fine roots; medium acid; clear smooth boundary.

Bt1—7 to 11 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; common fine and medium roots; strongly acid; clear smooth boundary.

Bt2—11 to 31 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common fine roots; few faint clay films; few fine chert pebbles; strongly acid; clear wavy boundary.

Bt3—31 to 36 inches; brown (7.5YR 4/4) silty clay loam; few medium distinct pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; firm; common fine roots; common faint clay films; 14 percent fine chert fragments; very strongly acid; abrupt wavy boundary.

2Bx1—36 to 45 inches; brown (7.5YR 4/4) extremely cherty clay loam; few medium distinct pale brown (10YR 6/3) mottles; massive; hard, brittle; 75 percent chert fragments—60 percent less than 3 inches in diameter, 15 percent 3 to 10 inches; very strongly acid; gradual wavy boundary.

2Bx2—45 to 52 inches; yellowish red (5YR 5/6) extremely cherty clay loam; massive; hard, brittle; 70 percent chert fragments—55 percent less than 3 inches in diameter, 15 percent 3 to 10 inches; very strongly acid; clear wavy boundary.

2Bt—52 to 64 inches; dark red (10R 3/6) cherty clay; many coarse distinct yellowish red (5YR 5/6) mottles; moderate very fine subangular blocky structure; very firm; common shiny pressure faces; 25 percent chert fragments; neutral.

The depth to the fragipan ranges from 27 to 40 inches. The thickness of the solum is more than 60 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It ranges from medium acid to neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The fragipan (2Bx horizon) has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam, clay loam, or silty clay loam and commonly is cherty to extremely cherty. The 2Bt horizon has hue of 7.5YR to 10R, value of 3 to 5, and chroma of 4 to 6. It is cherty analogues of silty clay or clay.

Wabash Series

The Wabash series consists of deep, very poorly drained soils on the flood plain of the Mississippi River. These soils formed in clayey alluvium in concave channels, depressions, and backswamps. Permeability is very slow. Slope is 0 to 1 percent.

Wabash soils are similar to Nameoki soils and are adjacent to Beaucoup, Carr, and Haynie soils in the landscape. Nameoki soils have loamy textures between depths of 24 and 45 inches. All the other soils are less clayey throughout than Wabash soils. Beaucoup soils are on positions similar to those of Wabash soils, and Carr and Haynie soils are on slightly higher positions on the flood plain and nearer the stream channel.

Typical pedon of Wabash silty clay; in a cultivated field, 1,700 feet west and 2,700 feet north of the southeast corner sec. 2, T. 37 N., R. 9 E.; UTM coordinates 4,203,150 meters N. and 763,060 meters E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay, gray (10YR 5/1) dry; moderate fine granular structure; firm; common fine roots; mildly alkaline; clear smooth boundary.

A—6 to 12 inches; very dark grayish brown (10YR 3/2) silty clay, gray (10YR 5/1) dry; moderate fine granular structure and very fine subangular blocky; firm; few fine roots; mildly alkaline; clear smooth boundary.

Bg1—12 to 26 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; few fine prominent dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; very firm; few very fine roots; few slickensides; mildly alkaline; diffused smooth boundary.

Bg2—26 to 73 inches; dark gray (10YR 4/1) silty clay; common medium prominent dark brown (7.5YR 4/4)

mottles; moderate medium subangular blocky structure; very firm; few very fine roots; common slickensides; few fine black stains on faces of peds; mildly alkaline.

The thickness of the solum ranges from 48 to 80 inches or more. The mollic epipedon commonly ranges from 24 to 36 inches but ranges to about 48 inches in some pedons. The soil is silty clay or clay throughout and is neutral to mildly alkaline.

The A horizon and the Bg1 horizon have hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0 to 2. The Bg2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 to 2.

Weingarten Series

The Weingarten series consists of deep, well drained soils on upland ridgetops and side slopes. These soils formed in loess, silty sediment, and residuum or other cherty red clayey material. Permeability is moderately slow. Slope ranges from 3 to about 14 percent.

Weingarten soils are similar to Minnith and Menfro soils and commonly are adjacent to the Gasconade, Goss, and Hildebrecht soils in the landscape. Gasconade soils are shallow to bedrock and are on steeper, lower positions than Weingarten soils. Goss soils have a very cherty clayey subsoil and are on steeper positions at lower elevations. Hildebrecht soils have a slowly permeable fragipan and are on similar ridgetop positions. Menfro soils do not have a 2B horizon. Minnith soils have more sand and do not have red clay in the lower part.

Typical pedon of Weingarten silt loam, 9 to 14 percent slopes; in pasture, 2,600 feet north and 200 feet east of the southwest corner sec. 5, T. 37 N., R. 8 E.; UTM coordinates 4,214,140 meters N. and 747,440 meters E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and very fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

BA—7 to 11 inches; yellowish brown (10YR 5/6) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt1—11 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; few faint clay films; thin silt coatings in lower 2 inches; strongly acid; abrupt smooth boundary.

Bt2—22 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; many distinct clay films; few thin silt coatings; very strongly acid; gradual smooth boundary.

Bt3—28 to 35 inches; dark yellowish brown (10YR 4/6) silt loam; weak fine subangular blocky structure; friable; few fine roots; few distinct clay films; very strongly acid; diffused wavy boundary.

Btx—35 to 51 inches; brown (10YR 5/3) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm, about 20 percent of the matrix is brittle; few distinct clay films; few fine dark concretions of iron and manganese oxides; medium acid; abrupt smooth boundary.

2Btb—51 to 72 inches; reddish brown (5YR 4/4) cherty clay; common medium distinct dark red (2.5YR 3/6) and dark brown (7.5YR 5/4) mottles; moderate very fine angular blocky structure; very firm; about 15 percent chert fragments; neutral.

Thickness of the loess and depth to the 2B horizon range from 40 to 60 inches. Thickness of the solum is 60 inches or more. Depth to bedrock commonly is 100 inches or more.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It ranges from medium acid to very strongly acid. The 2B horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 to 6. Chert content in the 2B horizon ranges from 5 to 50 percent or more.

Wilbur Series

The Wilbur series consists of deep, moderately well drained soils on flood plains. These soils formed in silty alluvium washed from loess covered uplands. Permeability is moderate. Slope is 0 to 2 percent.

Wilbur soils are similar and commonly adjacent to Haymond soils on flood plains. Haymond soils do not have mottles of 2 chroma above a depth of 36 inches and have dominantly brown silt loam throughout.

Typical pedon of Wilbur silt loam; in a cultivated field, 1,975 feet north and 600 feet west of the southeast corner sec. 31, T. 39 N., R. 8 E.; UTM coordinates 4,214,140 meters N. and 747,440 meters E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.

AC—9 to 18 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; common very fine roots; common small pores; few worm casts; neutral; clear smooth boundary.

C1—18 to 30 inches; brown (10YR 5/3) silt loam; common fine faint grayish brown (10YR 5/2) and common fine distinct dark brown (7.5YR 4/4) mottles; massive; faintly stratified; friable; common very fine roots; neutral; gradual smooth boundary.

C2—30 to 40 inches; mixed, brown (10YR 5/3) and grayish brown (10YR 5/2) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; massive; stratified; friable; few very fine roots; few black stains; neutral; gradual smooth boundary.

C3—40 to 60 inches; gray (10YR 5/1) silt loam; common medium distinct dark brown (10YR 3/3) mottles; weak fine granular structure; friable; common black stains; neutral.

The thickness of the solum ranges from 6 to 18 inches. The solum is slightly acid or neutral throughout. Mottles of 2 chroma or less are within a depth of 20 inches.

The A horizon commonly has value of 4 but ranges from 3 (unplowed) to 5 (recent deposits) and chroma of 2 or 3. The AC horizon has colors that are similar to those of the A horizon but does not have value of 3. The C horizon commonly is stratified, massive, and mottled. The C1 horizon has value of 4 or 5 and chroma of 3 or 4. It has mottles that have chroma of 2 or less. The C2 horizon and the material below this horizon have value of 4 or 5 and chroma of 2 or less.

Wilderness Series

The Wilderness series consists of deep, moderately well drained soils on uplands. Permeability is moderate above the fragipan and slow in the fragipan. These soils formed in cherty residuum or other cherty, silty, and loamy materials. Slope ranges from 14 to about 30 percent.

Wilderness soils are adjacent to Goss, Hildebrecht, and Union soils. Goss soils do not have a fragipan, have more clay in the subsoil than Wilderness soils, and are on positions similar to those of Wilderness soils. Hildebrecht and Union soils contain less than 15 percent coarse fragments above the fragipan and are on gentler, wider ridgetops upslope from Wilderness soils.

Typical pedon of Wilderness cherty silt loam, 14 to 30 percent slopes; in the Mark Twain National Forest, 500 feet south and 1,550 feet east of the northwest corner sec. 30, T. 35 N., R. 8 E.; UTM coordinates 4,177,550 meters N. and 747,330 meters E.

A—0 to 6 inches; dark brown (10YR 3/3) cherty silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many very fine roots; about 18 percent fine chert fragments; 1 inch partially decomposed leaves, pine needles, and twigs on surface; strongly acid; abrupt wavy boundary.

E—6 to 12 inches; brown (10YR 5/3) cherty silt loam; moderate fine granular structure; friable; common fine roots; 20 percent fine chert fragments; strongly acid; clear wavy boundary.

Bt1—12 to 20 inches; strong brown (7.5YR 5/6) cherty clay loam; moderate fine subangular blocky structure; firm; common fine roots; 30 percent fine chert fragments; very strongly acid; clear wavy boundary.

Bt2—20 to 27 inches; yellowish red (5YR 5/6) very cherty clay loam; moderate fine subangular blocky structure; firm; common very fine roots; 55 percent chert fragments—50 percent less than 3 inches in diameter, 5 percent 3 to 10 inches; very strongly acid; clear wavy boundary.

Ex—27 to 40 inches; light yellowish brown (10YR 6/4) very cherty loam; common medium distinct pinkish gray (7.5YR 6/2) and yellowish red (5YR 5/6) mottles; massive; very firm, very hard, brittle; few clay films; 70 percent chert fragments—30 percent less than 1/2 inch in diameter, 30 percent 1/2 inch to 3 inches, 10 percent 3 to 10 inches; very strongly acid; gradual wavy boundary.

Bx1—40 to 56 inches; reddish yellow (7.5YR 6/6) cherty silt loam; massive; very firm, very hard, brittle; few distinct reddish brown (5YR 4/4) clay films; few fine and medium black stains; 20 percent chert fragments; very strongly acid; clear wavy boundary.

Bx2—56 to 66 inches; strong brown (7.5YR 5/8) cherty clay loam; massive; weak fine subangular blocky structure bordering vertical cracks; very firm, brittle; few prominent dark brown (7.5YR 4/4) clay films on some vertical faces; few black stains; 20 percent chert fragments; very strongly acid.

The thickness of the solum commonly is more than 60 inches. Depth to the fragipan ranges from 24 to 29 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 through 4. The A horizon ranges from strongly acid to slightly acid. Chert content in the A horizon ranges from 15 to 30 percent. The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 through 6. It is strongly acid or very strongly acid. The Ex and Bx horizons have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. They are loam, silt loam, clay loam, or silty clay loam. Chert content ranges from 20 to 65 percent in the Bt horizon and from 20 to 75 percent in the fragipan. The fragipan is very strongly acid or extremely acid.

Formation of the Soils

This section describes the factors of soil formation, relates them to the formation of the soils in the survey area, and explains the processes of soil formation.

Factors of Soil Formation

Soils are continually changing. The characteristics of a soil at any given point are determined by the physical and mineralogical composition of the parent material; the living organisms on and in the soil; the climate under which the soil material accumulated and has existed since accumulation; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

Parent Material

Parent material is the unconsolidated mass from which soils form. In Ste. Genevieve County, soils have their origin in materials weathered from igneous rock, dolomite, limestone, sandstone, and red clay sediment; in wind deposited silty material, or loess; in water deposited alluvium; and in a minor amount of colluvium.

Igneous activity occurred in the western part of the county and probably was common as late as the Cretaceous Period (*10*). About 640 acres of Syenite soils formed in residuum from igneous rock. Most areas of these soils are included in the mapped areas of various other soils. Jonca, Pickle, and Fourche a du Clos Creeks have exposed the igneous rock in the areas of Syenite soils. The presence of diatremes, dikes, and pipes is other evidence of the igneous activity. These intrusives represent escape vents where explosive volcanic activity produced lapilli, areas of higher magnetic value, limited metamorphism, brecciation, chert, and various minerals. Present evidence of igneous activity is only in very small areas, probably because of the erosive, transportive, and leveling powers of the sea in which the igneous material was ejected. The watery setting served as the erosional agent to level the cone and surface ejecta. The explosive nature of these intrusions provided the erosive mechanism for the leveling and transportation of sediment. Much of the subsequent sedimentation was influenced by these disturbances.

Weathered sandstone provided loamy parent material for the formation of several soils in the county. Outcrops of sandstone of the Lamotte Formation on the Farmington Plain are among the oldest sources of sedimentary deposits. The high degree of activity associated with the weathering of this sandstone and depositing of the sediment is evident by the high content of sand, variations in stratification, and crossbedding in the sediment. The weakly cemented, well rounded, medium and coarse grained sand contributed to the formation of Jonca, Lamotte, Lily, and Ramsey soils. Outcrops of sandstone of the Everton and St. Peter Formations in the Zell Platform valley contributed to the formation of Minnith soils.

Limestone and dolomite formations are numerous. Some of these, for example the Bonneterre Formation, are completely chert-free. Others, such as the Gasconade Formation, are characteristically cherty. Residuum from the rock, for the most part, is thin but has contributed some parent material to soil formation. Gasconade soils formed in residuum from limestone and dolomite.

Of great importance to soil formation in the county is the red clay sediment that overlies the carbonate rock. On the Farmington Plain, deep deposits of red clay lie unconformably on sculptured, waterworn bedrock. The groove and pinnacled markings on the bedrock suggest a waterworn surface by current flow prior to deposition of the clay. Materials underlying the Salem Plateau are primarily thick beds of cherty, red clay. The chert is believed to be a heat-generated precipitate formed by the reaction of magma and sea water accompanied by the resulting hydrostatic pressure (*3*). The underwater volcanoes would not only account for the presence of chert, but also provide a mechanism for its distribution by deep water turbidity currents and sea waves produced by large-scale disturbances on the ocean floor. The red clays would then owe their origin to the wind-deposited volcanic dust and ash that accompanied these activities. Dust that rained down into the open sea would be deposited along with the chert and provide the parent material for the Goss soils. Inland waters, such as the Farmington Plain, were later sheltered from direct access to the sea and produced chert-free clays that give rise to the Caneyville, Crider, and Fourche soils.

Loess is an important parent material, especially along the eastern side of the county where thick deposits cover much of the area. On bluffs near the Mississippi River, the thickness of loess is as much as 30 feet. About 2 miles west of the River, the thickness of the loess is about 7 feet. Over the remainder of the county

the loess is less than 3 feet thick and is mainly on the stable ridgetops. Menfro soils formed in loess thicker than 6 feet. Weingarten soils formed in loess 40 to 60 inches thick. The upper part of the solum in Hildebrecht, Crider, Fourche, Minnith, Nicholson, and Union soils formed in loess. Some of the loess might be better described as loesslike since its origin and unweathered properties are not known. An example is the upper part of the profile in Jonca soils that contains some rounded sand grains and is thought to be windblown material of local origin. Another example is the Crider soils where in many places the silty upper part of the profile grades gradually into the underlying red clay deposits. A deposit of loesslike material is suggested by the presence of a stone line of chert fragments in some places, but the general boundary between the two different materials is rather obscure in most places.

Colluvium, or material that has moved downslope, is present at the base of most steep slopes throughout the county. It commonly contains more silty material than the slopes above. Soils on these positions are similar to the associated soils on the uplands and include Hildebrecht, Menfro, and Weingarten soils. Some small included areas of soils formed in colluvium are in the mapped areas of Bloomsdale and other soils on bottom lands.

Alluvial deposits from the Mississippi River and from smaller local streams cover about 10 percent of the county. Local streams have a basal deposit of gravelly material. Overlying this loamy material of various thicknesses. A typical pattern of soils is demonstrated by the Midco-Bloomsdale-Haymond soils. Midco soils, which are gravelly (cherty) throughout, are in the upper reaches; the silty Bloomsdale soils, which have gravel at a depth of 20 inches, grade downstream to Haymond soils, which have gravel at a depth of more than 40 inches. Where bottom land soils receive runoff from areas of Gasconade soils, they commonly have a mollic epipedon; an example is Ross soils.

The Mississippi River alluvium consists of clays, silts, and fine sands distributed by variations in stream velocity at floodtime. These deposits are neutral to mildly alkaline and contain large amounts of phosphorus, calcium, magnesium, and potassium. Carr soils contain a large amount of sand and are near the channel, Haynie and Beaucoup soils formed in silty deposits, and the Wabash soils are clayey throughout. These soils represent a general progression in distance from the channel and a decrease in water velocity.

Climate

Climate has been an important factor in the formation of the soils of Ste. Genevieve County. The humid continental climate has distinct seasonal temperature changes and a predictable rainfall distribution. This pattern has been generally stable for the period of recorded history (*16*).

Variations in temperature from high to low elevations have had little effect on soil formation, but temperature differences due to aspect have been significant on steep slopes. The thinner solum on south- and west-facing (warm) slopes suggests accelerated geologic erosion. Also, the tree species are inferior to those on north- and east-facing (cool) slopes, and growth patterns are slower.

Precipitation patterns are similar to those of temperature in that obvious deviations from the present are only apparent for periods prior to and during the accumulation of parent material. The geologic erosion that formed the present topography, stone lines, regional deposition of loess, and the basal alluvial gravel deposits suggests periods of more rainfall and greater water velocity. The late Pleistocene climatic changes agree with the period of aridity and deposition of loess (*4,7*). Climatic conditions since that time to the present have changed little.

From all observations, climate has been uniform for the period of soil formation. Differences in natural fertility, leaching, translocation of silicate clay minerals, and other soil variations are traceable to other factors. Additional information on the present climate is given in the section "General Nature of the Survey Area."

Living Organisms

Living organisms both in and on the soil have contributed to the alteration of parent material and to the properties of the soil. Plants, bacteria and fungi, burrowing animals, and man are active forces in soil formation. They have influenced the organic matter and nitrogen content, reaction, color, thickness, and kinds of horizons, structure, aeration, and other properties of the soil.

Plants greatly influence soil formation. Plant communities have varied according to the soil and its fertility, available water capacity, drainage, and depth. In Ste. Genevieve County, trees have been the dominant vegetative cover during soil formation. Windthrow has been a factor in soil mixing on soils that have a fragipan or that are shallow to bedrock. About 7 percent of the soils formed under native grassland. The thick, dark colored surface layer of the Gasconade soils is characteristic of the native grass influence. Small scattered areas of soils supporting prairies are included in the mapping of Caneyville, Bloomsdale, Midco, and Ramsey soils. The annual return of grass residue affects the physical, biological, and chemical composition of the surface layer. For example, bases extracted from the soil by plants are eventually returned to the soil.

Micro-organisms play an important part in the decay and decomposition of plant residue. By reducing new material to soil humus, they release plant nutrients, enhance soil structure, and improve the general physical condition of the surface layer. Soil properties that favor

biological activity in the soil are a high percentage of organic matter, neutral or nearly neutral soil reaction, aeration, low bulk density, and medium texture. Of the soils in Ste. Genevieve County, the Ashton, Bloomsdale, Carr, Haymond, and Ross soils have the most noticeable evidence of burrowing rodents, earthworms, and insects.

Intensive cultivation, clearing of trees, and other activities of man also influence soil formation. In places, cultivation has mixed the surface layer with the subsurface layer, lowered the organic matter content, reduced biological activity in the soil, decreased the stability of soil structure, and in many places, increased runoff and erosion. Erosion has, in some places, removed the original surface layer, thereby lowering the fertility and productivity of the soil. By introducing new crops and by adding chemicals, such as fertilizer and herbicides, man alters soil formation.

Relief

Relief refers to the lay of the land. The term is used to describe the general unevenness of the land surface, the variations in height, and the nature of the slopes in between. The difference in elevation from the ridgetop to the adjacent valley floor varies from one landform to another. Relief is highest, about 300 feet, in the dissected Salem Plateau. On the Farmington and Karst Plains it averages about 150 feet. On the flood plains relief ranges from 10 to about 20 feet. Slopes commonly are steep on the dissected Salem Plateau and the River Hills. The lower plains tend to be more gentle and rolling. Most flood plains are nearly level.

Relief results from natural forces that create inequities in land surfaces. The Salem Plateau is the plain of a former base level grossly dissected by geologic erosion. The Farmington Plain, Zell Platform, and the Karst Plain represent a later base level interrupted by faulting, folding, and erosion. Initial erosion of the freshly exposed sediment resulted in deep entrenchment of streams as the base level was lowered. Reduced rainfall and runoff and leveling of most streams have caused lateral erosion and the widening and filling of valleys.

Relief affects soil formation through its effect on climate, rate of erosion, and water movement within the landscape. Steepness of slope influences the amount of runoff, water infiltration, rate of leaching, clay movement, and thickness of the solum. Soil temperature is directly related to aspect and steepness of slope. Orientation of the slope moderates or intensifies the affect of climate.

The rate of erosion depends on the nature of the soil material, the steepness of slope, and the amount of runoff. Relief has greatly influenced the original deposition and also the removal of loess. Except for the eastern part of the county, loess remains only on stable upland positions such as ridgetops.

Position on the landscape affects water movement and water balance. Gentle uplands absorb a considerable amount of moisture, steep side slopes generate a high percentage of runoff, and low side slopes receive runoff from adjoining areas in addition to direct rainfall. Length, shape, and gradient of slope affect soil-water relationships. Also closely associated are the water movement and the water table that are so important to soil interpretations.

Time

Time allows climate, living organisms, and relief to exert their influence on parent material. The degree to which the material is altered determines the age of a soil and is therefore inferred from its morphology. The practical implication of a soil's age is how it affects the productivity, use, and management.

The most fertile and productive soils in the county formed in recent alluvium. They meet all the qualifications of youth. The Carr, Beaucoup, Haynie, Haymond, and Wilbur soils are young. They are on flood plains.

Terrace positions represent landforms intermediate in age between the flood plains and upland. Ashton soils on the low terraces exemplify this transitional stage by retaining much of the youthful fertility but exhibiting some maturity by the weakly expressed argillic horizon. Freeburg soils on the upper terrace level conform to the same interpretation by showing slightly more maturity indicated by slightly less fertility and a better expressed argillic horizon. Auxvasse soils on the middle terrace, however, are exceptions. Their clayey argillic subsoil is a strongly expressed horizon indicative of advanced age. The soil, in actuality, cannot be older than the landscape on which it exists. The clayey subsoil, therefore, must be interpreted as a depositional layer of different parent material and not attributed to actual chronological age.

Upland soils, for the most part, show evidences of age by their lower fertility levels, strongly expressed argillic horizons, and their associations with older landforms. The presence of a fragipan is also indicative of age. The Caneyville, Goss, and Lily soils formed in material older than the loess. Their differences can be attributed primarily to parent material. Menfro soils formed completely in loess. Crider, Hildebrecht, Minnith, and Weingarten soils formed in both loess and the underlying older materials.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grade stabilization structure. A structure for the purpose of stabilizing the grade of a gully or other watercourse, thereby preventing further head-cutting or lowering of the channel grade.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated

by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, alluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illite. Three-layer, micalike clay minerals that are widely distributed in argillaceous sediments, that are intermediate in composition and structure between muscovite and montmorillonite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kaolinite. Two-layer clay minerals generally derived from alteration or alkali feldspars and micas. Compared to three-layer clay minerals they have a lower base-exchange capacity, absorb less water, have a lower plasticity index, a lower liquid limit, and less shrinkage when drying from a wet state.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

No-tillage. A method of planting crops that involves no seedbed preparation other than opening the soil for the purpose of placing the seed at the intended depth. This usually involves opening a small slit or punching a hole into the soil. There is usually no cultivation during crop production. Chemical weed control is normally used. Also referred to as slot planting or zero tillage.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk

density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive*

(the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface horizon (A, E, AB, EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons and all the subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-79 at Farmington, Mo.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	41.2	19.8	30.5	69	-11	18	2.09	0.75	3.19	5	3.1
February---	46.7	24.2	35.5	74	-3	21	2.59	1.43	3.60	5	3.3
March------	55.7	32.4	44.1	82	7	81	4.19	2.05	6.04	7	3.3
April------	69.1	43.9	56.5	89	21	218	4.41	2.39	6.19	7	.0
May--------	77.1	51.6	64.4	91	31	446	4.12	2.40	5.63	8	.0
June-------	85.1	60.3	72.7	96	42	681	3.58	1.77	5.14	6	.0
July-------	89.3	64.0	76.7	101	46	828	3.89	1.69	5.76	6	.0
August-----	88.0	61.8	74.9	101	46	772	3.62	1.75	5.22	5	.0
September--	81.2	54.3	67.8	96	34	534	3.22	1.18	4.92	6	.0
October----	70.9	42.5	56.7	89	23	242	2.29	0.83	3.49	4	.0
November---	56.3	33.3	44.8	78	9	43	3.46	1.51	5.11	6	1.2
December---	45.2	25.3	35.3	71	0	9	2.99	1.14	4.53	6	1.8
Yearly:											
Average--	67.2	42.8	55.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-11	---	---	---	---	---	---
Total----	---	---	---	---	---	3,893	40.45	32.51	46.71	71	12.7

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-79 at Farmington, Mo.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 17	April 29	May 8
2 years in 10 later than--	April 12	April 23	May 3
5 years in 10 later than--	April 3	April 13	April 22
First freezing temperature in fall:			
1 year in 10 earlier than--	October 21	October 4	September 29
2 years in 10 earlier than--	October 25	October 9	October 3
5 years in 10 earlier than--	November 3	October 19	October 12

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-79 at Farmington, Mo.]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	195	166	150
8 years in 10	201	173	157
5 years in 10	213	188	172
2 years in 10	225	203	187
1 year in 10	231	211	194

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1C	Lamotte silt loam, 5 to 9 percent slopes	545	0.2
1D	Lamotte silt loam, 9 to 14 percent slopes	1,355	0.4
2C	Caneyville silt loam, 3 to 9 percent slopes	4,840	1.5
2D	Caneyville silt loam, 9 to 14 percent slopes	6,160	1.9
2E	Caneyville stony silt loam, 14 to 20 percent slopes	7,160	2.2
7C	Jonca silt loam, 3 to 9 percent slopes	20,500	6.3
8C	Hildebrecht silt loam, 3 to 9 percent slopes	7,465	2.3
8D	Hildebrecht silt loam, 9 to 14 percent slopes	4,540	1.4
11C	Union silt loam, 3 to 9 percent slopes	3,430	1.0
12E	Goss cherty silt loam, 14 to 35 percent slopes	61,100	18.7
14C	Minnith silt loam, 3 to 9 percent slopes	3,280	1.0
14D	Minnith silt loam, 9 to 14 percent slopes	6,555	2.0
15F	Goss-Menfro complex, 14 to 45 percent slopes	14,840	4.5
16C	Menfro silt loam, 3 to 9 percent slopes	6,050	1.8
16D2	Menfro silt loam, 9 to 14 percent slopes, eroded	10,000	3.1
16E2	Menfro silt loam, 14 to 20 percent slopes, eroded	5,050	1.5
17C	Menfro silt loam, karst, 2 to 14 percent slopes	7,565	2.3
17E	Menfro silt loam, karst, 9 to 35 percent slopes	3,125	1.0
18F	Gasconade-Menfro complex, 14 to 50 percent slopes	9,370	2.9
19C	Crider silt loam, 3 to 9 percent slopes	3,475	1.1
19D	Crider silt loam, 9 to 14 percent slopes	1,510	0.5
20B	Fourche silt loam, 2 to 5 percent slopes	4,280	1.3
20C	Fourche silt loam, 5 to 9 percent slopes	6,455	2.0
21C	Nicholson silt loam, 3 to 9 percent slopes	1,260	0.4
22E	Wilderness cherty silt loam, 14 to 30 percent slopes	8,270	2.5
23B	Gerald silt loam, 1 to 4 percent slopes	1,360	0.4
25A	Auxvasse silt loam, 0 to 3 percent slopes	1,660	0.5
34C	Weingarten silt loam, 3 to 9 percent slopes	7,670	2.3
34D	Weingarten silt loam, 9 to 14 percent slopes	16,950	5.2
39D	Lily loam, 9 to 14 percent slopes	22,200	6.8
40E	Ramsey stony loam, 14 to 35 percent slopes	13,320	4.1
41E	Gasconade stony silty clay loam, 9 to 35 percent slopes	16,350	5.0
43E	Syenite very bouldery silt loam, 14 to 35 percent slopes	645	0.2
50A	Ashton silt loam, 0 to 3 percent slopes	2,270	0.7
52A	Freeburg silt loam, 0 to 3 percent slopes	1,610	0.5
64	Carr fine sandy loam	1,410	0.4
65	Ross silt loam	2,020	0.6
66	Haymond silt loam	6,060	1.8
67	Wilbur silt loam	2,370	0.7
70	Beaucoup silty clay loam	1,510	0.5
81A	Midco cherty silt loam, 1 to 3 percent slopes	960	0.3
82A	Bloomsdale silt loam, 0 to 3 percent slopes	6,060	1.8
83	Wabash silty clay	2,980	0.9
93	Pits-Orthents complex	250	0.1
94	Dumps, mine	122	*
424	Haynie silt loam	3,780	1.2
590	Nameoki silty clay loam	2,720	0.8
	Water more than 40 acres or stream wider than 1/8 mile	4,621	1.4
	Total	327,078	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
20B	Fourche silt loam, 2 to 5 percent slopes
23B	Gerald silt loam, 1 to 4 percent slopes (where drained)
25A	Auxvasse silt loam, 0 to 3 percent slopes (where drained)
50A	Ashton silt loam, 0 to 3 percent slopes
52A	Freeburg silt loam, 0 to 3 percent slopes
64	Carr fine sandy loam
65	Ross silt loam (where protected from flooding)
66	Haymond silt loam (where protected from flooding)
67	Wilbur silt loam (where protected from flooding)
70	Beaucoup silty clay loam (where drained and protected from flooding)
82A	Bloomsdale silt loam, 0 to 3 percent slopes (where protected from flooding)
83	Wabash silty clay (where drained)
424	Haynie silt loam (where protected from flooding)
590	Nameoki silty clay loam (where protected from flooding)

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	AUM*
1C---------------- Lamotte	IIIe	78	28	32	65	3.5	7.0
1D---------------- Lamotte	IVe	62	22	26	52	3.0	5.5
2C---------------- Caneyville	IIIe	85	25	35	75	4.0	7.0
2D---------------- Caneyville	IVe	70	21	30	65	3.5	6.5
2E---------------- Caneyville	VIe	---	---	---	---	---	5.0
7C---------------- Jonca	IIIe	62	20	26	65	2.8	5.5
8C---------------- Hildebrecht	IIIe	80	30	32	70	3.6	7.2
8D---------------- Hildebrecht	IVe	70	25	26	62	3.4	6.8
11C--------------- Union	IIIe	55	---	36	60	3.5	7.0
12E--------------- Goss	VIIs	---	---	---	---	---	3.0
14C--------------- Minnith	IIIe	90	34	37	77	4.0	8.0
14D--------------- Minnith	IVe	78	29	32	66	3.5	7.0
15F--------------- Goss-Menfro	VIIs	---	---	---	---	---	---
16C--------------- Menfro	IIIe	95	31	45	---	3.7	7.4
16D2-------------- Menfro	IIIe	80	26	35	---	3.2	6.8
16E2-------------- Menfro	IVe	57	18	20	---	2.8	6.0
17C--------------- Menfro	IIIe	95	31	35	---	3.7	7.4
17E--------------- Menfro	VIe	---	---	---	---	3.0	6.0
18F--------------- Gasconade-Menfro	VIIs	---	---	---	---	---	---
19C--------------- Crider	IIIe	95	40	45	95	4.0	8.0
19D--------------- Crider	IVe	85	30	35	80	3.5	7.6

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	AUM*
20B------------- Fourche	IIe	90	34	38	78	4.0	7.8
20C------------- Fourche	IIIe	85	32	35	75	3.8	7.5
21C------------- Nicholson	IIe	90	40	40	75	3.5	7.0
22E------------- Wilderness	VIs	---	---	---	---	1.4	2.8
23B------------- Gerald	IIw	65	28	34	75	3.2	6.4
25A------------- Auxvasse	IIIw	80	31	35	72	3.7	7.4
34C------------- Weingarten	IIIe	84	31	35	72	3.7	6.4
34D------------- Weingarten	IVe	66	24	27	55	3.0	5.0
39D------------- Lily	IVe	70	---	---	---	2.5	---
40E------------- Ramsey	VIIs	---	---	---	---	---	---
41E------------- Gasconade	VIIs	---	---	---	---	---	2.0
43E------------- Syenite	VIIe	---	---	---	---	---	3.0
50A------------- Ashton	I	110	45	48	100	4.5	9.0
52A------------- Freeburg	IIw	92	35	38	80	4.0	8.0
64-------------- Carr	IIs	85	27	45	75	4.0	---
65-------------- Ross	IIw	110	44	50	---	4.5	8.8
66-------------- Haymond	IIw	110	44	50	---	3.7	8.0
67-------------- Wilbur	IIw	90	44	50	---	4.1	8.2
70-------------- Beaucoup	IIw	110	46	50	---	4.5	---
81A------------- Midco	IIIs	55	20	30	65	2.8	6.0
82A------------- Bloomsdale	IIe	80	30	32	70	3.5	6.8
83-------------- Wabash	IIIw	90	44	45	65	2.0	---
93**------------ Pits-Orthents	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	AUM*
94**. Dumps							
424------------- Haynie	IIw	96	36	---	---	3.6	---
590------------- Nameoki	IIIw	110	42	44	---	4.1	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
1C, 1D----------- Lamotte	3o	Slight	Slight	Slight	Slight	White oak-----------	62	Black oak, shortleaf pine, scarlet oak, white oak, black walnut.
						Northern red oak----	82	
						Shortleaf pine------	64	
						Black oak-----------	---	
2C, 2D----------- Caneyville	4c	Slight	Slight	Severe	Severe	Northern red oak----	69	Yellow-poplar, eastern white pine, shortleaf pine.
						Black oak-----------	---	
						Eastern redcedar----	---	
2E--------------- Caneyville	4x	Moderate	Moderate	Severe	Severe	Northern red oak----	69	Yellow-poplar, eastern white pine, shortleaf pine.
						Black oak-----------	---	
						Eastern redcedar----	---	
7C--------------- Jonca	4o	Slight	Slight	Slight	Slight	White oak-----------	58	Shortleaf pine, black oak, white oak.
						Black oak-----------	65	
						Northern red oak----	---	
8C, 8D----------- Hildebrecht	4o	Slight	Slight	Slight	Slight	Scarlet oak---------	56	Shortleaf pine, loblolly pine.
						Northern red oak----	---	
						Black oak-----------	---	
						White oak-----------	---	
11C-------------- Union	4o	Slight	Slight	Slight	Slight	Shortleaf pine------	56	Shortleaf pine, scarlet oak, white oak, northern red oak, white ash.
						White oak-----------	55	
						Northern red oak----	---	
						Black oak-----------	---	
12E-------------- Goss	4f	Slight	Moderate	Moderate	Slight	White oak-----------	60	Sweetgum, yellow-poplar, green ash.
						Shortleaf pine------	---	
						Post oak------------	---	
						Blackjack oak-------	---	
						Black oak-----------	---	
14C, 14D--------- Minnith	3o	Slight	Slight	Slight	Slight	Shortleaf pine------	70	Shortleaf pine, white ash, yellow-poplar, white oak, northern red oak, black oak.
						Northern red oak----	---	
						White oak-----------	---	
15F*:								
Goss-------------	4f	Slight	Severe	Moderate	Slight	White oak-----------	56	Sweetgum, yellow-poplar, green ash, shortleaf pine.
						Shortleaf pine------	---	
						Post oak------------	---	
						Blackjack oak-------	---	
						Black oak-----------	---	
Menfro-----------	3r	Moderate	Moderate	Moderate	Slight	White oak-----------	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak----	75	
						Black oak-----------	73	
						White ash-----------	70	
						Sugar maple---------	68	
16C, 16D2-------- Menfro	3o	Slight	Slight	Slight	Slight	White oak-----------	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak----	75	
						Black oak-----------	73	
						White ash-----------	70	
						Sugar maple---------	68	
16E2------------- Menfro	3r	Moderate	Moderate	Moderate	Slight	White oak-----------	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak----	75	
						Black oak-----------	73	
						White ash-----------	70	
						Sugar maple---------	68	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
17C Menfro	3o	Slight	Slight	Slight	Slight	White oak Northern red oak Black oak White ash Sugar maple	65 75 73 70 68	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
17E Menfro	3r	Moderate	Moderate	Moderate	Slight	White oak Northern red oak Black oak White ash Sugar maple	65 75 73 70 68	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
18F*:								
Gasconade	5x	Slight	Severe	Moderate	Moderate	Eastern redcedar Chinkapin oak White ash Sugar maple Mockernut hickory Post oak Blackjack oak	30 --- --- --- --- --- ---	Eastern redcedar, shortleaf pine.
Menfro	3r	Moderate	Moderate	Moderate	Slight	White oak Northern red oak Black oak White ash Sugar maple	65 75 73 70 68	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
19C, 19D Crider	3o	Slight	Slight	Slight	Slight	Northern red oak White oak Virginia pine Shortleaf pine	70 66 --- ---	Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash.
20B, 20C Fourche	3o	Slight	Slight	Slight	Slight	White oak Green ash	63 72	White oak, shortleaf pine, eastern white pine, southern red oak, green ash, black oak.
21C Nicholson	3o	Slight	Slight	Slight	Slight	Northern red oak Black oak White oak Hickory Sweetgum	80 76 71 --- ---	Black oak, yellow-poplar, white oak, sweetgum, white ash.
22E Wilderness	4d	Moderate	Moderate	Moderate	Moderate	White oak Black oak	55 ---	White oak, shortleaf pine, black oak.
25A Auxvasse	4w	Slight	Severe	Moderate	Moderate	Pin oak Northern red oak Silver maple Green ash	76 --- --- ---	Pin oak, white oak, green ash, eastern cottonwood, silver maple, sweetgum.
34C, 34D Weingarten	3o	Slight	Slight	Slight	Slight	Northern red oak White oak Black oak Shortleaf pine	70 66 --- ---	Black oak, northern red oak, shortleaf pine, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
39D---------------- Lily	4o	Slight	Slight	Slight	Slight	Shortleaf pine------ Virginia pine-------	63 65	Loblolly pine, shortleaf pine, Virginia pine, white oak.
40E---------------- Ramsey	5x	Severe	Severe	Severe	Severe	White oak-----------	---	Virginia pine, shortleaf pine, eastern white pine, loblolly pine.
41E---------------- Gasconade	5x	Slight	Severe	Moderate	Moderate	Eastern redcedar---- Chinkapin oak------- White ash----------- Sugar maple--------- Mockernut hickory--- Post oak------------ Blackjack oak-------	30 --- --- --- --- --- ---	Eastern redcedar, shortleaf pine.
43E---------------- Syenite	5x	Moderate	Severe	Slight	Slight	White oak----------- Northern red oak---- Black oak-----------	46 --- ---	Shortleaf pine, white oak, northern red oak.
50A---------------- Ashton	1o	Slight	Slight	Slight	Slight	Northern red oak---- Pin oak------------- Shumard oak---------	85 --- 94	Eastern white pine, yellow-poplar, black walnut, sweetgum, cherrybark oak.
52A---------------- Freeburg	3o	Slight	Slight	Slight	Slight	White oak-----------	65	White oak, pin oak, green ash, eastern cottonwood, yellow-poplar, black oak, pecan.
64----------------- Carr	3o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore--- Black walnut-------- Green ash-----------	90 --- --- ---	Eastern cottonwood, American sycamore, black walnut, green ash.
65----------------- Ross	1o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple--------- White oak----------- Black walnut-------- Black cherry-------- White ash-----------	86 85 --- --- --- ---	Eastern white pine, black walnut, white ash, yellow-poplar.
66----------------- Haymond	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- White oak----------- Black walnut--------	110 90 70	Eastern white pine, black walnut, yellow-poplar, eastern cottonwood.
67----------------- Wilbur	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Silver maple--------	110 ---	Eastern white pine, black walnut, yellow-poplar, eastern cottonwood.
70----------------- Beaucoup	2w	Slight	Severe	Moderate	Moderate	Pin oak------------- Eastern cottonwood-- Silver maple-------- Cherrybark oak------ American sycamore---	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak.
81A---------------- Midco	4f	Slight	Slight	Moderate	Slight	White oak----------- American sycamore--- Shortleaf pine------ Black oak-----------	55 --- --- 60	White oak, shortleaf pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
82A------------------ Bloomsdale	3o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Northern red oak---- American sycamore--- White oak----------- Black oak----------- Sugar maple--------- Blackgum------------	94 68 --- --- --- --- ---	Shortleaf pine, American sycamore, northern red oak, white oak, eastern cottonwood.
83------------------ Wabash	4w	Slight	Severe	Severe	Moderate	Pin oak------------- Eastern cottonwood--	75 ---	Pin oak, pecan, eastern cottonwood.
424------------------ Haynie	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore--- Black walnut-------- Green ash-----------	110 110 --- ---	Black walnut, eastern cottonwood, green ash.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
1C, 1D: Lamotte	---	Amur honeysuckle, autumn-olive, Amur maple, lilac.	Eastern redcedar, hackberry, Russian-olive.	Norway spruce, green ash, honeylocust, pin oak, eastern white pine.	---
2C, 2D, 2E: Caneyville	Amur honeysuckle, fragrant sumac, lilac.	Autumn-olive	Austrian pine, bur oak, eastern red-cedar, Russian-olive, hackberry, green ash.	Honeylocust, Siberian elm.	---
7C: Jonca	Lilac	Amur honeysuckle, Manchurian crabapple, autumn-olive, Amur maple.	Austrian pine, Russian-olive, hackberry, eastern redcedar, jack pine, green ash.	Honeylocust	---
8C, 8D: Hildebrecht	Lilac	Autumn-olive, Amur honeysuckle, Amur maple, Manchurian crabapple.	Russian-olive, hackberry, jack pine, eastern redcedar, green ash, Austrian pine.	Honeylocust	---
11C: Union	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
12E: Goss	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Eastern redcedar, Austrian pine, honeylocust, hackberry, green ash, bur oak, Russian-olive.	Siberian elm	---
14C, 14D: Minnith	---	Lilac, Amur honeysuckle, Amur maple, autumn-olive.	Russian-olive, hackberry, eastern redcedar.	Honeylocust, Norway spruce, green ash, pin oak, eastern white pine.	---
15F*:					
Goss	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
16C, 16D2, 16E2, 17C, 17E Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
18F*: Gasconade.					
Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
19C, 19D Crider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
20B, 20C Fourche	---	Lilac, Amur maple, autumn-olive. Amur honeysuckle.	Eastern redcedar, Russian-olive.	Green ash, Norway spruce, honeylocust, eastern white pine, hackberry, pin oak.	---
21C Nicholson	Lilac	Amur honeysuckle, autumn-olive, Amur maple, Manchurian crabapple.	Eastern redcedar, Russian-olive, Austrian pine, jack pine, hackberry, green ash.	Honeylocust	---
22E Wilderness	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Honeylocust, Austrian pine, hackberry, eastern redcedar, green ash, bur oak, Russian-olive.	Siberian elm	---
23B Gerald	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn-olive.	Eastern redcedar, Austrian pine, hackberry, green ash, jack pine, Russian-olive.	Honeylocust	---
25A Auxvasse	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
34C, 34D Weingarten	---	Lilac, Amur honeysuckle, Amur maple, autumn-olive.	Russian-olive, hackberry, eastern redcedar.	Honeylocust, Norway spruce, green ash, pin oak, eastern white pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
39D Lily	Amur honeysuckle, fragrant sumac, lilac.	Autumn-olive	Eastern redcedar, Russian-olive, Austrian pine, bur oak, hackberry, green ash.	Honeylocust, Siberian elm.	---
40E. Ramsey					
41E. Gasconade					
43E Syenite	Amur honeysuckle, lilac, fragrant sumac.	Autumn-olive	Austrian pine, eastern redcedar, bur oak, Russian-olive, green ash, hackberry.	Honeylocust, Siberian elm.	---
50A Ashton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
52A Freeburg	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce	Eastern white pine, pin oak.
64 Carr	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow, golden willow.	Eastern cottonwood.
65 Ross	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
66 Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
67 Wilbur	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
70 Beaucoup	---	Nannyberry viburnum, Siberian peashrub, silky dogwood, Tatarian honeysuckle, Washington hawthorn.	Eastern redcedar, northern white-cedar, green ash.	Black willow, golden willow.	Eastern cottonwood.
81A Midco	---	Autumn-olive, Amur honeysuckle, Amur maple, lilac.	Eastern redcedar	Austrian pine, honeylocust, pin oak, eastern white pine, hackberry, green ash.	Eastern cottonwood.
82A Bloomsdale	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Austrian pine, eastern redcedar.	Eastern white pine, hackberry, green ash, pin oak, honeylocust.	Eastern cottonwood.
83 Wabash	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, Washington hawthorn.	Eastern white pine	---
93*:					
Pits.					
Orthents.					
94*. Dumps					
424 Haynie	Blackhaw	Tatarian honeysuckle, Siberian peashrub.	Russian-olive, osageorange, eastern redcedar, Washington hawthorn.	Green ash, hackberry, honeylocust, bur oak.	Eastern cottonwood.
590 Nameoki	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Blue spruce, northern white-cedar, Austrian pine, white fir, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1C----- Lamotte	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
1D----- Lamotte	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
2C----- Caneyville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight-----	Moderate: thin layer.
2D----- Caneyville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
2E----- Caneyville	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: erodes easily.	Severe: large stones, slope.
7C----- Jonca	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Severe: slope.	Slight-----	Slight.
8C----- Hildebrecht	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight-----	Slight.
8D----- Hildebrecht	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
11C----- Union	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight-----	Moderate: wetness.
12E----- Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
14C----- Minnith	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
14D----- Minnith	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
15F*:					
Goss-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Menfro-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
16C----- Menfro	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
16D2------------------- Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
16E2------------------- Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
17C-------------------- Menfro	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
17E-------------------- Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
18F*:					
Gasconade------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
Menfro---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
19C-------------------- Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
19D-------------------- Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
20B-------------------- Fourche	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
20C-------------------- Fourche	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
21C-------------------- Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
22E-------------------- Wilderness	Severe: slope, wetness.	Severe: slope.	Severe: slope, small stones, wetness.	Moderate: wetness, slope.	Severe: droughty, slope.
23B-------------------- Gerald	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
25A-------------------- Auxvasse	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
34C-------------------- Weingarten	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
34D-------------------- Weingarten	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
39D: Lily	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
40E: Ramsey	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Moderate: large stones, slope.	Severe: slope, thin layer.
41E: Gasconade	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth tc rock.	Severe: large stones.	Severe: large stones, slope, thin layer.
43E: Syenite	Severe: slope.	Severe: slope.	Severe: large stones, slope.		Severe: slope.
50A: Ashton	Severe: flooding.	Slight	Slight	Slight	Slight.
52A: Freeburg	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
64: Carr	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
65: Ross	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
66: Haymond	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
67: Wilbur	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
70: Beaucoup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
81A: Midco	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: droughty, flooding.
82A: Bloomsdale	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
83: Wabash	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
93*: Pits.					
Orthents.					
94*. Dumps					
424: Haynie	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
590: Nameoki	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1C-- Lamotte	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1D-- Lamotte	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2C-- Caneyville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2D-- Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2E-- Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
7C-- Jonca	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8C, 8D-- Hildebrecht	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11C-- Union	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
12E-- Goss	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
14C, 14D-- Minnith	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15F*:										
Goss--	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Menfro--	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16C, 16D2-- Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16E2-- Menfro	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
17C-- Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17E-- Menfro	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18F*:										
Gasconade--	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Menfro--	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
19C-- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
19D: Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
20B, 20C: Fourche	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
21C: Nicholson	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
22E: Wilderness	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
23B: Gerald	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
25A: Auxvasse	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
34C, 34D: Weingarten	Fair	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
39D: Lily	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
40E: Ramsey	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
41E: Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
43E: Syenite	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
50A: Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
52A: Freeburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
64: Carr	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
65: Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
66: Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
67: Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
70: Beaucoup	Good	Good	Good	Fair	Fair	Good	Good	Good	Good	Good.
81A: Midco	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
82A: Bloomsdale	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
83: Wabash	Poor	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
93*: Pits.										

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
93*: Orthents.										
94*. Dumps										
424------------------ Haynie	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
590------------------ Nameoki	Poor	Fair	Fair	Good	Good	Poor	Good	Fair	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1C------------------ Lamotte	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
1D------------------ Lamotte	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
2C------------------ Caneyville	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
2D------------------ Caneyville	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
2E------------------ Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: large stones, slope.
7C------------------ Jonca	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: low strength.	Slight.
8C------------------ Hildebrecht	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
8D------------------ Hildebrecht	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
11C----------------- Union	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
12E----------------- Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
14C----------------- Minnith	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
14D----------------- Minnith	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
15F*:						
Goss---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Menfro-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
16C------ Menfro	Slight------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
16D2------ Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
16E2------ Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
17C------ Menfro	Slight------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
17E------ Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
18F*:						
Gasconade------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Menfro------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
19C------ Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
19D------ Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
20B------ Fourche	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
20C------ Fourche	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
21C------ Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: wetness.
22E------ Wilderness	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: slope.	Severe: droughty, slope.
23B------ Gerald	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
25A------ Auxvasse	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
34C------ Weingarten	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
34D---------------- Weingarten	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
39D---------------- Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
40E---------------- Ramsey	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
41E---------------- Gasconade	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
43E---------------- Syenite	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
50A---------------- Ashton	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
52A---------------- Freeburg	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Moderate: wetness.
64----------------- Carr	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
65----------------- Ross	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
66----------------- Haymond	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
67----------------- Wilbur	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
70----------------- Beaucoup	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
81A---------------- Midco	Moderate: large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
82A---------------- Bloomsdale	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
83----------------- Wabash	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, too clayey.
93*: Pits.						
Orthents.						
94*. Dumps						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
424----------------- Haynie	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
590----------------- Nameoki	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, frost action.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1C------------------ Lamotte	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
1D------------------ Lamotte	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
2C------------------ Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
2D------------------ Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
2E------------------ Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
7C------------------ Jonca	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
8C------------------ Hildebrecht	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: small stones.
8D------------------ Hildebrecht	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Poor: small stones.
11C----------------- Union	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey.
12E----------------- Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
14C----------------- Minnith	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, small stones.
14D----------------- Minnith	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, small stones, slope.
15F*:					
Goss---------------	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
Menfro-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
16C----- Menfro	Slight-----	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
16D2----- Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
16E2----- Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
17C----- Menfro	Slight-----	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
17E----- Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
18F*:					
Gasconade-----	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
Menfro-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
19C----- Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
19D----- Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
20B----- Fourche	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
20C----- Fourche	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
21C----- Nicholson	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
22E----- Wilderness	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, small stones, slope.
23B----- Gerald	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
25A----- Auxvasse	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: wetness.
34C----- Weingarten	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
34D----- Weingarten	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, thin layer.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39D------------------ Lily	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
40E------------------ Ramsey	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
41E------------------ Gasconade	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
43E------------------ Syenite	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
50A------------------ Ashton	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Fair: too clayey.
52A------------------ Freeburg	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
64------------------- Carr	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: thin layer.
65------------------- Ross	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
66------------------- Haymond	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
67------------------- Wilbur	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
70------------------- Beaucoup	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
81A------------------ Midco	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage, small stones.
82A------------------ Bloomsdale	Severe: flooding.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, small stones.
83------------------- Wabash	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
93*: Pits.					
Orthents.					
94*. Dumps					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
424-----------------Haynie	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
590-----------------Nameoki	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1C------------------- Lamotte	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1D------------------- Lamotte	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
2C, 2D--------------- Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
2E------------------- Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, large stones, slope.
7C------------------- Jonca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
8C, 8D--------------- Hildebrecht	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
11C------------------ Union	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
12E------------------ Goss	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
14C------------------ Minnith	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
14D------------------ Minnith	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
15F*:				
Goss-----------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Menfro---------------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
16C------------------ Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
16D2----------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
16E2----------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
17C------------------ Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
17E-------------------- Menfro	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
18F*:				
Gasconade------------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Menfro---------------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
19C-------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
19D-------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
20B, 20C--------------- Fourche	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, thin layer.
21C-------------------- Nicholson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
22E-------------------- Wilderness	Fair: large stones, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
23B-------------------- Gerald	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
25A-------------------- Auxvasse	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
34C-------------------- Weingarten	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
34D-------------------- Weingarten	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
39D-------------------- Lily	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
40E-------------------- Ramsey	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
41E-------------------- Gasconade	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
43E-------------------- Syenite	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
50A-------------------- Ashton	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
52A: Freeburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
64: Carr	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
65: Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
66: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
67: Wilbur	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
70: Beaucoup	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
81A: Midco	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
82A: Bloomsdale	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
83: Wabash	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
93*: Pits.				
Orthents.				
94*. Dumps				
424: Haynie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
590: Nameoki	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1C Lamotte	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope	Favorable	Favorable.
1D Lamotte	Severe: slope.	Moderate: thin layer.	Deep to water	Slope	Slope	Slope.
2C Caneyville	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock	Depth to rock.
2D Caneyville	Moderate: depth to rock, slope.	Severe: thin layer, hard to pack.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock.	Slope, depth to rock.
2E Caneyville	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water	Depth to rock, slope, erodes easily.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
7C Jonca	Moderate: seepage, slope.	Moderate: wetness, thin layer.	Percs slowly, slope.	Wetness, percs slowly, rooting depth, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
8C Hildebrecht	Moderate: seepage, slope.	Moderate: piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
8D Hildebrecht	Severe: slope.	Moderate: piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
11C Union	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
12E Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
14C Minnith	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
14D Minnith	Severe: slope.	Moderate: piping, wetness.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
15F*:						
Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
16C Menfro	Moderate: slope, seepage.	Slight	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
16D2, 16E2 Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
17C----------------- Menfro	Moderate: slope, seepage.	Slight---------	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
17E----------------- Menfro	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
18F*:						
Gasconade---------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Menfro------------	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
19C, 19D----------- Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
20B, 20C----------- Fourche	Moderate: slope.	Moderate: hard to pack, wetness.	Slope----------	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
21C----------------- Nicholson	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
22E----------------- Wilderness	Severe: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Slope, large stones, wetness.	Large stones, wetness, slope.
23B----------------- Gerald	Slight---------	Moderate: piping, wetness.	Percs slowly, frost action.	Wetness, droughty, percs slowly.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
25A----------------- Auxvasse	Slight---------	Moderate: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
34C----------------- Weingarten	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
34D----------------- Weingarten	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
39D----------------- Lily	Severe: seepage, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
40E----------------- Ramsey	Severe: depth to rock, slope.	Severe: seepage, piping.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
41E----------------- Gasconade	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
43E----------------- Syenite	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
50A----------------- Ashton	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
52A----------------- Freeburg	Slight---------	Severe: wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
64------------------ Carr	Severe: seepage.	Severe: piping.	Deep to water	Flooding-------	Soil blowing---	Favorable.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
65----------------- Ross	Severe: seepage.	Severe: piping.	Deep to water	Flooding--------	Favorable-------	Favorable.
66----------------- Haymond	Moderate: seepage.	Severe: piping.	Deep to water	Flooding--------	Erodes easily	Erodes easily.
67----------------- Wilbur	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Erodes easily.
70----------------- Beaucoup	Slight----------	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding---------	Wetness.
81A---------------- Midco	Severe: seepage.	Severe: seepage.	Deep to water	Large stones, droughty.	Large stones---	Large stones, droughty.
82A---------------- Bloomsdale	Moderate: seepage.	Moderate: large stones.	Deep to water	Flooding--------	Large stones---	Large stones.
83----------------- Wabash	Slight----------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, droughty, slow intake.	Wetness, percs slowly.	Wetness, droughty, percs slowly.
93*: Pits.						
Orthents.						
94*. Dumps						
424---------------- Haynie	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
590---------------- Nameoki	Moderate: seepage.	Severe: piping, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness---------	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1C, 1D----------- Lamotte	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	80-100	60-90	20-32	5-11
	11-64	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0	100	95-100	80-95	40-80	30-50	15-30
2C, 2D----------- Caneyville	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	7-25	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
2E--------------- Caneyville	0-7	Stony silt loam	ML, CL, CL-ML	A-4, A-6	5-30	90-100	85-100	75-100	60-95	20-35	2-12
	7-31	Silty clay, clay, silty clay loam.	CH, CL	A-7	5-30	90-100	85-100	75-100	65-100	42-70	20-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7C--------------- Jonca	0-12	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	80-100	65-90	23-32	5-11
	12-32	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	100	80-100	65-90	34-50	15-30
	32-52	Loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	90-100	70-90	45-85	25-40	8-20
	52-62	Sandy loam, sandy clay loam, clay loam.	SC, CL, SM, ML	A-6, A-7, A-4	0-10	90-100	75-95	60-85	40-80	32-50	8-22
	62	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8C, 8D----------- Hildebrecht	0-7	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	95-100	90-100	20-30	3-10
	7-38	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	12-22
	38-59	Silt loam, extremely cherty silt loam, extremely cherty silty clay loam.	GC, CL, SC, SM-SC	A-6, A-2, A-4, A-7	0-10	60-95	30-80	30-75	25-70	25-45	6-22
	59-75	Very cherty clay, clay, cherty silty clay.	CL, CH, SC, GC	A-7, A-2-7	0-10	60-100	30-100	30-100	25-95	45-75	22-40
11C-------------- Union	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	22-35	5-15
	7-11	Silty clay loam, silty clay.	CL	A-6, A-7	0-10	85-95	80-90	75-85	65-75	35-50	15-30
	11-36	Silt loam, cherty silt loam, very cherty silty clay loam.	CL	A-7, A-6, A-4	0-20	85-95	70-90	65-85	55-75	25-45	8-22
	36-52	Silty clay loam, cherty silty clay loam, extremely cherty clay loam.	CL, SC, GC	A-7, A-2, A-6	0-20	60-90	40-85	35-65	30-60	35-50	15-25
	52-64	Clay, very cherty clay, cherty clay.	CL, CH, SC, GC	A-7	0-20	65-95	50-90	45-65	40-60	45-80	25-45
12E-------------- Goss	0-3	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	3-14	Very cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	14-60	Cherty silty clay loam, very cherty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14C, 14D--------- Minnith	0-18	Silt loam--------	CL	A-6, A-4	0	100	100	90-100	90-95	20-35	8-15
	18-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	85-90	30-45	13-21
	34-59	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	90-100	65-95	45-80	30-50	10-30
	59-85	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0-5	95-100	90-100	60-90	40-80	25-40	10-20
	85	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
15F*:											
Goss------------	0-3	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	3-14	Very cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	14-60	Cherty silty clay loam, very cherty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
Menfro----------	0-12	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	12-46	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	46-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
16C, 16D2, 16E2-- Menfro	0-7	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	7-52	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	52-72	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
17C-------------- Menfro	0-15	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	15-56	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	56-72	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
17E-------------- Menfro	0-15	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	15-56	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	56-70	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
18F*:											
Gasconade--------	0-7	Flaggy silty clay loam.	CL	A-6	20-70	75-90	70-85	60-75	55-65	30-40	15-25
	7-14	Flaggy silty clay, flaggy clay, very flaggy silty clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Menfro----------	0-9	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	9-36	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	36-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
19C, 19D--------- Crider	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	13-29	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	29-65	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
20B, 20C--------- Fourche	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-95	25-35	5-15
	6-30	Silty clay loam	CL	A-7, A-6	0	100	95-100	90-100	85-95	35-45	15-25
	30-76	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	85-100	75-100	70-100	60-95	40-60	25-40

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
21C---------------- Nicholson	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	8-25	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	85-100	85-100	80-100	25-45	5-20
	25-51	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	51-68	Silty clay, clay, channery clay.	CH, CL	A-6, A-7	0-10	80-100	70-100	60-100	55-95	34-70	16-40
22E---------------- Wilderness	0-12	Cherty silt loam	SM-SC, SC, SP-SC, GC	A-1, A-4, A-2-4	0-10	60-85	50-75	20-50	10-40	20-30	5-10
	12-27	Very cherty clay loam, cherty clay loam.	GC, GP-GC, SC, SP-SC	A-6, A-2-6	5-15	40-70	20-60	10-50	10-40	25-40	10-20
	27-56	Cherty silt loam, very cherty loam.	GM-GC, GC, GP-GC	A-1, A-2-4, A-2-6	10-40	30-60	10-45	10-40	5-35	20-40	5-15
	56-66	Very cherty silty clay, cherty clay loam.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25
23B---------------- Gerald	0-13	Silt loam--------	CL	A-6	0-5	95-100	85-100	80-95	75-90	30-40	11-20
	13-29	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	85-100	70-100	65-95	60-90	43-55	21-30
	29-53	Silt loam, silty clay loam, cherty silty clay loam.	SC, CL, GC	A-2-6, A-2-7, A-6, A-7	0-5	65-95	35-85	30-80	30-70	35-45	14-21
	53-60	Clay, cherty silty clay, cherty silty clay loam.	SC, CL, CH, GC	A-2-7, A-7	0-5	40-85	35-65	35-65	30-60	43-65	21-39
25A---------------- Auxvasse	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	13-44	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	44-72	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	90-96	35-45	20-25
34C, 34D---------- Weingarten	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-35	5-15
	11-35	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	95-100	30-45	11-25
	35-51	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	95-100	95-100	25-40	7-18
	51-72	Cherty clay, cherty silty clay, cherty silty clay loam.	GC, CL, CH, SC	A-7	0-25	45-95	40-90	40-90	35-85	45-65	25-40
39D---------------- Lily	0-9	Loam--------------	ML	A-4	0-5	90-100	85-100	70-95	55-75	<35	NP-7
	9-24	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	24-31	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-b	0-10	65-100	50-100	40-95	20-75	<35	3-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
40E---------------- Ramsey	0-15	Stony loam, loam	SM, CL-ML, ML, SM-SC	A-4, A-2	5-15	75-90	65-85	50-75	30-65	<25	NP-7
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
41E------------- Gasconade	0-14	Stony silty clay loam.	CL	A-6	3-70	75-90	70-85	60-75	55-65	30-40	15-25
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43E------------- Syenite	0-9	Very bouldery silt loam.	CL-ML, CL	A-4, A-6	3-25	90-100	85-100	70-90	60-85	25-35	5-15
	9-25	Silt loam, loam, sandy clay loam.	SC, CL	A-6, A-7	0-5	90-100	75-100	70-90	45-80	35-45	15-22
	25-36	Silt loam, loam, clay loam.	SC, CL	A-4, A-6	0-5	85-100	75-100	60-85	45-80	25-35	7-15
	36-55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
50A------------- Ashton	0-12	Silt loam--------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	12-58	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	80-100	25-42	5-20
	58-72	Silt loam, loam, fine sandy loam.	ML, CL, SM, CL-ML	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
52A------------- Freeburg	0-26	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	90-100	15-35	5-15
	26-54	Silty clay loam	CL	A-6, A-7	0	100	100	85-100	85-100	30-45	15-25
	54-70	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	85-100	70-100	30-45	15-25
64-------------- Carr	0-9	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-75	10-25	2-10
	9-60	Stratified fine sandy loam to loam.	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-65	10-25	2-10
65-------------- Ross	0-10	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	10-66	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
66-------------- Haymond	0-9	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	9-59	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	59-72	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
67-------------- Wilbur	0-9	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
	9-60	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
70-------------- Beaucoup	0-19	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-25
	19-44	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
	44-60	Stratified very fine sandy loam to silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	90-100	65-95	25-45	5-25
81A------------- Midco	0-6	Cherty silt loam	SM, SM-SC, GM, GM-GC	A-4, A-2-4	5-20	60-80	55-75	40-70	30-49	<25	2-7
	6-24	Gravelly loam, very cherty loam, very cherty sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1-b	5-25	35-70	30-65	30-60	20-35	<25	2-7
	24-63	Very cherty loam, very cherty sandy loam, very gravelly loam.	GM, GP-GM	A-1	5-30	15-40	10-35	10-30	5-20	<20	NP-4

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
82A-------------- Bloomsdale	0-20	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	95-100	85-100	20-30	4-12
	20-32	Cherty silt loam, very cherty loam, very cherty clay loam.	GC, GM-GC	A-2, A-4, A-6	0-20	45-65	30-60	25-55	25-45	20-40	5-20
	32-60	Extremely cherty clay, very cherty clay, very cherty clay loam.	GC, SC, GP-GC, SP-SC	A-2	10-40	55-85	15-30	15-30	10-30	40-70	20-40
83--------------- Wabash	0-6	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-75	30-50
	6-73	Silty clay, clay	CH	A-7	0	100	100	100	95-100	52-78	30-55
93*: Pits.											
Orthents.											
94*. Dumps											
424-------------- Haynie	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-100	25-40	5-15
	9-60	Silt loam, very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	85-100	25-35	5-15
590-------------- Nameoki	0-15	Silty clay loam	CL, CH	A-7	0	100	100	100	90-100	45-65	20-40
	15-30	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-100	45-65	20-40
	30-52	Silt loam, sandy loam, silty clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	95-100	80-95	40-85	25-40	5-15
	52-70	Very fine sand, silt loam, silty clay loam.	ML, CL, SM, SC	A-2, A-4, A-6	0	100	90-100	60-90	5-80	20-40	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
1C, 1D	0-11	10-20	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low	0.32	4	.5-1
Lamotte	11-64	25-35	1.40-1.60	0.2-2.0	0.15-0.20	3.6-6.0	Moderate	0.32		
2C, 2D	0-7	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low	0.43	3	2-4
Caneyville	7-25	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate	0.28		
	25	---	---	---	---	---	---	---		
2E	0-7	10-31	1.20-1.40	0.6-2.0	0.15-0.22	4.5-6.0	Low	0.28	3	2-4
Caneyville	7-31	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	0.28		
	31	---	---	---	---	---	---	---		
7C	0-12	12-18	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.43	4	1-2
Jonca	12-32	25-35	1.30-1.50	0.2-0.6	0.15-0.18	4.5-5.5	Moderate	0.43		
	32-52	18-25	1.60-1.90	0.06-0.2	0.01-0.10	3.6-5.0	Low	0.43		
	52-62	15-35	1.40-1.60	0.2-2.0	0.01-0.10	4.5-6.5	Low	0.43		
	62	---	---	---	---	---	---	---		
8C, 8D	0-7	8-20	1.35-1.45	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.43	4	1-2
Hildebrecht	7-38	20-35	1.40-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	38-59	12-35	1.60-1.80	0.06-0.2	0.03-0.05	3.6-5.5	Low	0.43		
	59-75	35-70	1.30-1.40	0.2-0.6	0.11-0.15	4.5-6.0	Moderate	0.28		
11C	0-7	10-27	1.35-1.45	0.6-2.0	0.13-0.21	5.6-6.5	Moderate	0.43	4	.5-2
Union	7-11	27-45	1.30-1.40	0.6-2.0	0.13-0.21	4.5-5.5	Moderate	0.43		
	11-36	15-35	1.60-1.80	0.06-0.2	0.03-0.05	3.6-5.0	Moderate	0.43		
	36-52	27-40	1.30-1.45	0.2-0.6	0.15-0.20	4.5-6.0	Low	0.43		
	52-64	40-80	1.30-1.40	0.2-0.6	0.11-0.15	4.5-6.0	High	0.43		
12E	0-3	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low	0.24	2	1-2
Goss	3-14	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low	0.24		
	14-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24		
14C, 14D	0-18	10-27	1.30-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.37	5	1-2
Minnith	18-34	25-35	1.30-1.60	0.2-2.0	0.20-0.22	4.5-7.3	Moderate	0.37		
	34-59	15-40	1.40-1.60	0.2-0.6	0.16-0.20	4.5-7.3	Moderate	0.37		
	59-85	15-35	1.40-1.60	0.2-2.0	0.14-0.22	4.5-7.3	Moderate	0.37		
	85	---	---	---	---	---	---	---		
15F*:										
Goss	0-3	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low	0.24	2	1-2
	3-14	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low	0.24		
	14-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24		
Menfro	0-12	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	.5-2
	12-46	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37		
	46-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37		
16C, 16D2, 16E2	0-7	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	.5-2
Menfro	7-52	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37		
	52-72	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37		
17C	0-15	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	.5-2
Menfro	15-56	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37		
	56-72	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37		
17E	0-15	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	.5-2
Menfro	15-56	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37		
	56-70	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
18F*:										
Gasconade--------	0-7	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	2-4
	7-14	35-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20		
	14	---	---	---	---	---	-------------	----		
Menfro-----------	0-9	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	.5-2
	9-36	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37		
	36-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37		
19C, 19D--------- Crider	0-13	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.32	5	2-4
	13-29	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.28		
	29-65	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate-----	0.28		
20B, 20C--------- Fourche	0-6	10-25	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37	5	1-2
	6-30	27-35	1.40-1.60	0.2-0.6	0.16-0.20	4.5-6.0	Moderate-----	0.37		
	30-76	35-55	1.30-1.60	0.2-0.6	0.09-0.13	4.5-7.8	Moderate-----	0.37		
21C-------------- Nicholson	0-8	12-30	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low----------	0.43	3	2-4
	8-25	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.43		
	25-51	18-35	1.50-1.70	0.06-0.2	0.07-0.12	4.5-6.5	Low----------	0.43		
	51-68	35-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-7.8	Moderate-----	0.37		
22E-------------- Wilderness	0-12	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-6.5	Low----------	0.28	2-1	.5-2
	12-27	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28		
	27-56	20-35	1.70-2.00	0.06-0.2	---	4.5-5.0	Low----------	0.28		
	56-66	40-70	1.50-1.70	0.2-0.6	---	4.5-5.5	Moderate-----	0.28		
23B-------------- Gerald	0-13	20-25	1.30-1.50	0.6-2.0	0.15-0.18	4.5-6.0	Low----------	0.43	4	.5-2
	13-29	35-45	1.40-1.60	<0.06	0.05-0.10	4.5-5.5	High---------	0.43		
	29-53	25-35	1.60-1.80	<0.06	0.01-0.05	4.5-5.5	Low----------	0.43		
	53-60	35-60	1.40-1.60	0.2-0.6	0.03-0.08	4.5-5.5	Moderate-----	0.43		
25A-------------- Auxvasse	0-13	8-16	1.30-1.45	0.6-2.0	0.22-0.24	5.6-6.5	Low----------	0.43	3	.5-1
	13-44	45-60	1.35-1.50	<0.06	0.09-0.11	4.5-5.5	High---------	0.43		
	44-72	25-40	1.35-1.50	0.2-0.6	0.18-0.20	4.5-5.5	Moderate-----	0.43		
34C, 34D--------- Weingarten	0-11	10-27	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.37	5	1-2
	11-35	20-35	1.30-1.60	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	35-51	15-30	1.50-1.70	0.2-0.6	0.10-0.15	5.1-6.5	Low----------	0.37		
	51-72	35-60	1.30-1.50	0.6-2.0	0.05-0.10	5.1-7.8	Moderate-----	0.24		
39D-------------- Lily	0-9	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low----------	0.28	3	.5-4
	9-24	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.28		
	24-31	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	31	---	---	---	---	---	-------------	----		
40E-------------- Ramsey	0-15	8-25	1.25-1.50	6.0-20	0.06-0.10	4.5-5.5	Low----------	0.17	1	---
	15	---	---	---	---	---	-------------	----		
41E-------------- Gasconade	0-14	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	2-4
	14	---	---	---	---	---	-------------	----		
43E-------------- Syenite	0-9	12-25	1.20-1.40	0.6-2.0	0.12-0.20	5.1-6.5	Low----------	0.28	4	1-2
	9-25	25-35	1.30-1.50	0.2-0.6	0.10-0.18	3.6-5.5	Low----------	0.28		
	25-36	15-27	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.0	Low----------	0.28		
	36-55	---	---	---	---	---	-------------	----		
50A-------------- Ashton	0-12	10-25	1.20-1.40	0.6-2.0	0.16-0.23	5.6-7.3	Low----------	0.32	5	2-4
	12-58	18-34	1.20-1.50	0.6-2.0	0.18-0.23	5.6-7.3	Low----------	0.43		
	58-72	10-40	1.25-1.55	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.43		
52A-------------- Freeburg	0-26	12-25	1.20-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.37	5	.5-2
	26-54	27-35	1.40-1.50	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.37		
	54-70	27-35	1.40-1.50	0.2-0.6	0.15-0.19	4.5-5.5	Moderate-----	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
64----------------- Carr	0-9	5-15	1.50-1.75	2.0-6.0	0.14-0.20	7.4-8.4	Low-----------	0.24	5	<1
	9-60	5-15	1.50-1.75	2.0-6.0	0.13-0.18	7.4-8.4	Low-----------	0.24		
65----------------- Ross	0-10	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low-----------	0.32	5	3-5
	10-66	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low-----------	0.32		
66----------------- Haymond	0-9	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	1-3
	9-59	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37		
	59-72	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.37		
67----------------- Wilbur	0-9	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	1-3
	9-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37		
70----------------- Beaucoup	0-19	27-35	1.25-1.45	0.2-0.6	0.21-0.23	5.6-7.8	Moderate-----	0.32	5	5-6
	19-44	27-35	1.30-1.50	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.32		
	44-60	15-30	1.35-1.55	0.2-0.6	0.18-0.22	5.6-7.8	Moderate-----	0.32		
81A---------------- Midco	0-6	15-25	1.10-1.30	2.0-6.0	0.09-0.13	5.6-6.5	Low-----------	0.24	4	.5-2
	6-24	15-25	1.20-1.40	2.0-6.0	0.05-0.11	5.1-7.3	Low-----------	0.24		
	24-63	15-25	1.10-1.30	2.0-6.0	0.02-0.06	5.1-7.3	Low-----------	0.24		
82A---------------- Bloomsdale	0-20	10-20	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	4	1-2
	20-32	12-30	1.30-1.50	0.6-2.0	0.06-0.15	5.6-7.3	Moderate-----	0.28		
	32-60	30-60	1.20-1.50	0.6-2.0	0.03-0.07	5.6-7.3	Moderate-----	0.28		
83----------------- Wabash	0-6	40-46	1.25-1.45	<0.06	0.12-0.14	5.6-7.3	Very high----	0.28	5	2-4
	6-73	40-60	1.20-1.45	<0.06	0.08-0.12	5.6-7.8	Very high----	0.28		
93*: Pits.										
Orthents.										
94*. Dumps										
424---------------- Haynie	0-9	15-25	1.20-1.35	0.6-2.0	0.18-0.23	7.4-8.4	Low-----------	0.37	5	1-3
	9-60	15-18	1.20-1.35	0.6-2.0	0.18-0.23	7.4-8.4	Low-----------	0.37		
590---------------- Nameoki	0-15	35-60	1.20-1.40	<0.06	0.12-0.21	6.1-7.3	High----------	0.28	5	2-4
	15-30	35-60	1.30-1.50	<0.06	0.11-0.18	5.1-7.3	High----------	0.28		
	30-52	7-30	1.45-1.70	0.6-2.0	0.12-0.20	5.1-7.8	Low-----------	0.28		
	52-70	5-30	1.50-1.80	0.6-2.0	0.05-0.20	5.6-7.8	Low-----------	0.28		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1C, 1D----------- Lamotte	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
2C, 2D----------- Caneyville	C	None--------	---	---	>6.0	---	---	20-40	Hard	---	High-----	Moderate.
2E--------------- Caneyville	C	None--------	---	---	>6.0	---	---	20-40	Hard	---	High-----	Moderate.
7C--------------- Jonca	C	None--------	---	---	2.0-3.0	Perched	Nov-May	>60	---	Moderate	Moderate	High.
8C, 8D----------- Hildebrecht	C	None--------	---	---	2.0-2.5	Perched	Nov-May	>60	---	Moderate	Moderate	High.
11C-------------- Union	C	None--------	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	High-----	High.
12E-------------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
14C, 14D--------- Minnith	C	None--------	---	---	3.0-5.0	Apparent	Nov-Apr	>60	---	Moderate	Moderate	Moderate.
15F*:												
Goss-------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Menfro-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
16C, 16D2, 16E2, 17C, 17E-------- Menfro	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
18F*:												
Gasconade--------	D	None--------	---	---	>6.0	---	---	4-20	Hard	Moderate	High-----	Low.
Menfro-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
19C, 19D--------- Crider	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
20B, 20C--------- Fourche	B	None--------	---	---	1.5-3.0	Perched	Nov-May	>60	---	Moderate	Moderate	Moderate.
21C-------------- Nicholson	C	None--------	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	---	High-----	Moderate.
22E-------------- Wilderness	C	None--------	---	---	1.0-2.0	Perched	Dec-Mar	>60	---	Moderate	Low------	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
23B----------------- Gerald	D	None---------	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High------	High------	High.
25A----------------- Auxvasse	D	Rare---------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High------	High.
34C, 34D----------- Weingarten	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
39D----------------- Lily	B	None---------	---	---	>6.0	---	---	20-40	Hard	---	Moderate	High.
40E----------------- Ramsey	D	None---------	---	---	>6.0	---	---	10-20	Hard	---	Low-------	Moderate.
41E----------------- Gasconade	D	None---------	---	---	>6.0	---	---	4-20	Hard	Moderate	High------	Low.
43E----------------- Syenite	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
50A----------------- Ashton	B	Rare---------	---	---	>6.0	---	---	>60	---	---	Low-------	Low.
52A----------------- Freeburg	C	None---------	---	---	1.5-3.0	Apparent	Nov-May	>60	---	High------	High------	High.
64------------------ Carr	B	Occasional	Brief------	Mar-Sep	>6.0	---	---	>60	---	Low-------	Low-------	Low.
65------------------ Ross	B	Frequent-----	Very brief	Nov-Jun	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low-------	Low.
66------------------ Haymond	B	Frequent-----	Very brief	Jan-May	>6.0	---	---	>60	---	High------	Low-------	Low.
67------------------ Wilbur	B	Frequent-----	Brief------	Oct-Jun	1.5-3.0	Apparent	Mar-Apr	>60	---	High------	Moderate	Moderate.
70------------------ Beaucoup	B/D	Frequent-----	Brief to long.	Mar-Jun	.5-2.0	Apparent	Mar-Jun	>60	---	High------	High------	Low.
81A----------------- Midco	A	Frequent-----	Very brief	Nov-Apr	>6.0	---	---	>60	---	Moderate	Low-------	Moderate.
82A----------------- Bloomsdale	B	Frequent-----	Very brief	Dec-May	>6.0	---	---	>60	---	Moderate	Low-------	Moderate.
83------------------ Wabash	D	Occasional	Brief to long.	Nov-May	0-1.0	Apparent	Nov-May	>60	---	Moderate	High------	Moderate.
93*: Pits.												

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
93*: Orthents.												
94*. Dumps												
424---------------- Haynie	B	Frequent----	Brief-----	Feb-Nov	>6.0	---	---	>60	---	High-----	Low-------	Low.
590---------------- Nameoki	D	Frequent----	Brief to long.	Mar-Jun	1.0-3.0	Apparent	Jan-Jun	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
*Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Auxvasse	Fine, montmorillonitic, mesic Aeric Albaqualfs
Beaucoup	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Bloomsdale	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Carr	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Fourche	Fine-silty, mixed, mesic Glossic Paleudalfs
Freeburg	Fine-silty, mixed, mesic Aquic Hapludalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Gerald	Fine, mixed, mesic Umbric Fragiaqualfs
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Haynie	Coarse-silty, mixed (calcareous), mesic Mollic Udifluvents
Hildebrecht	Fine-silty, mixed, mesic Typic Fragiudalfs
Jonca	Fine-loamy, mixed, mesic Typic Fragiudalfs
Lamotte	Fine-loamy, mixed, mesic Ultic Hapludalfs
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Menfro	Fine-silty, mixed, mesic Typic Hapludalfs
Midco	Loamy-skeletal, siliceous, nonacid, mesic Typic Udifluvents
Minnith	Fine-silty, mixed, mesic Typic Hapludalfs
Nameoki	Fine, montmorillonitic, mesic Vertic Hapludolls
*Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Orthents	Mixed, mesic Typic Udorthents
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
*Syenite	Fine-loamy, mixed, mesic Typic Hapludults
Union	Fine, mixed, mesic Typic Fragiudalfs
Wabash	Fine, montmorillonitic, mesic Vertic Haplaquolls
Weingarten	Fine-silty, mixed, mesic Typic Hapludalfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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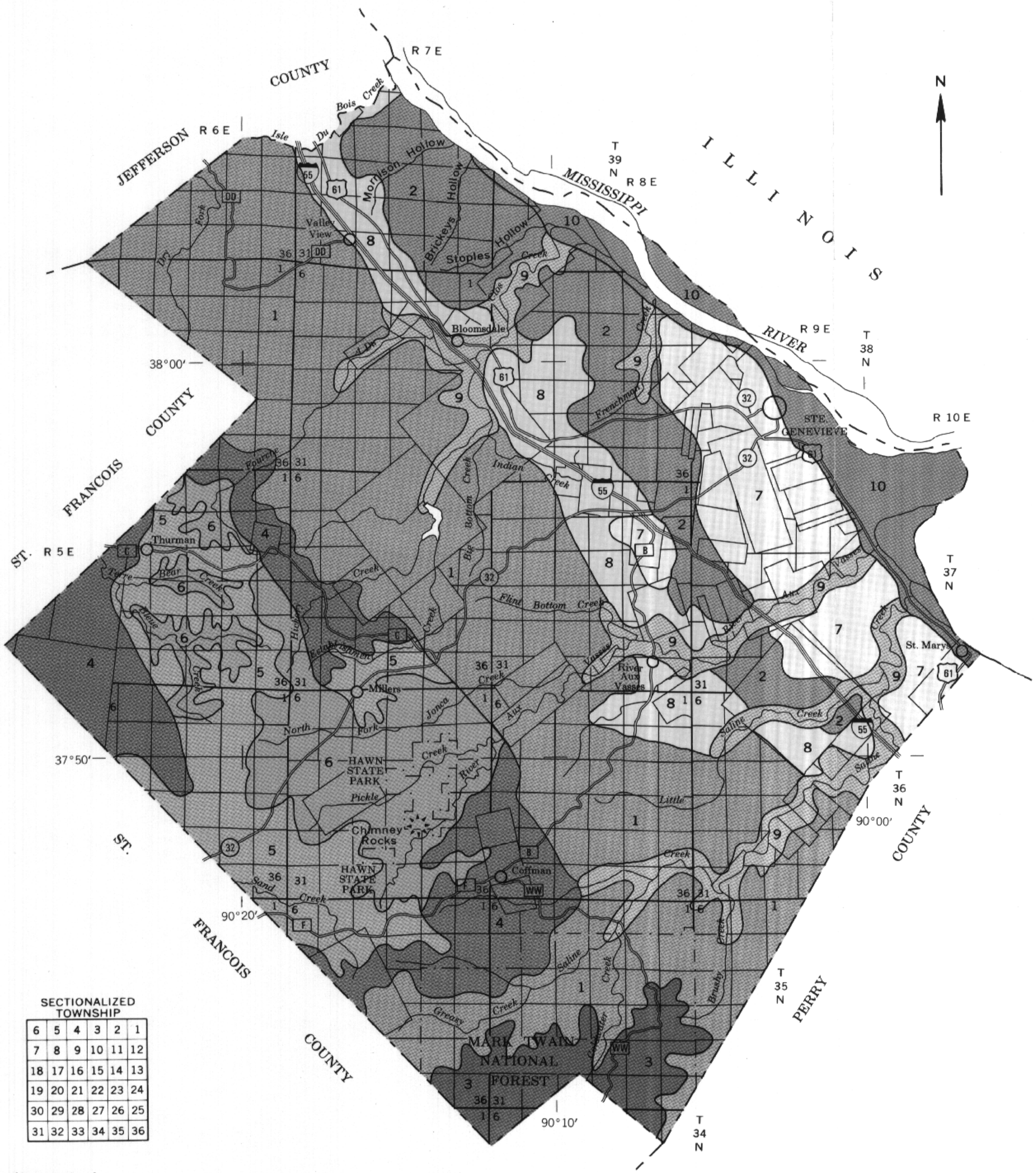
Accessibility Statement



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

DOMINANTLY DEEP SOILS FORMED IN RESIDUUM OR OTHER CHERTY MATERIAL AND LOESS

1 GOSS-WEINGARTEN-HILDEBRECHT association: Well drained and moderately well drained, moderately sloping to steep soils; on uplands

2 GOSS-MENFRO-GASCONADE association: Well drained and somewhat excessively drained, moderately steep to very steep soils; on uplands

3 WILDERNESS-UNION association: Moderately well drained, gently sloping to steep soils; on uplands

DOMINANTLY DEEP AND MODERATELY DEEP SOILS FORMED IN THIN LOESS AND RESIDUUM OR OTHER SILTY OR CLAYEY MATERIAL

4 FOURCHE-CANEYVILLE-CRIDER association: Moderately well drained and well drained, gently sloping to moderately steep soils; on uplands

DEEP TO SHALLOW SOILS FORMED IN LOAMY RESIDUUM OR THIN LOESS AND LOAMY RESIDUUM

5 JONCA-LILY association: Moderately well drained and well drained, moderately sloping and strongly sloping soils; on uplands

6 LILY-RAMSEY association: Well drained and somewhat excessively drained, strongly sloping to steep soils; on uplands

DOMINANTLY DEEP SOILS FORMED IN LOESS OR LOESS AND LOAMY RESIDUUM

7 MENFRO association: Well drained, undulating to steep soils; on karst uplands

8 MINNITH-MENFRO association; Moderately well drained and well drained, moderately sloping and strongly sloping soils; on uplands

DOMINANTLY DEEP SOILS FORMED IN ALLUVIUM, SUBJECT TO FLOODING

9 HAYMOND-ROSS-ASHTON association: Well drained, nearly level soils; on flood plains and terraces

10 HAYNIE-WABASH-NAMEOKI association: Moderately well drained to very poorly drained, nearly level soils; on flood plains

Compiled 1983

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

STE. GENEVIEVE COUNTY, MISSOURI

Scale 1:273,989

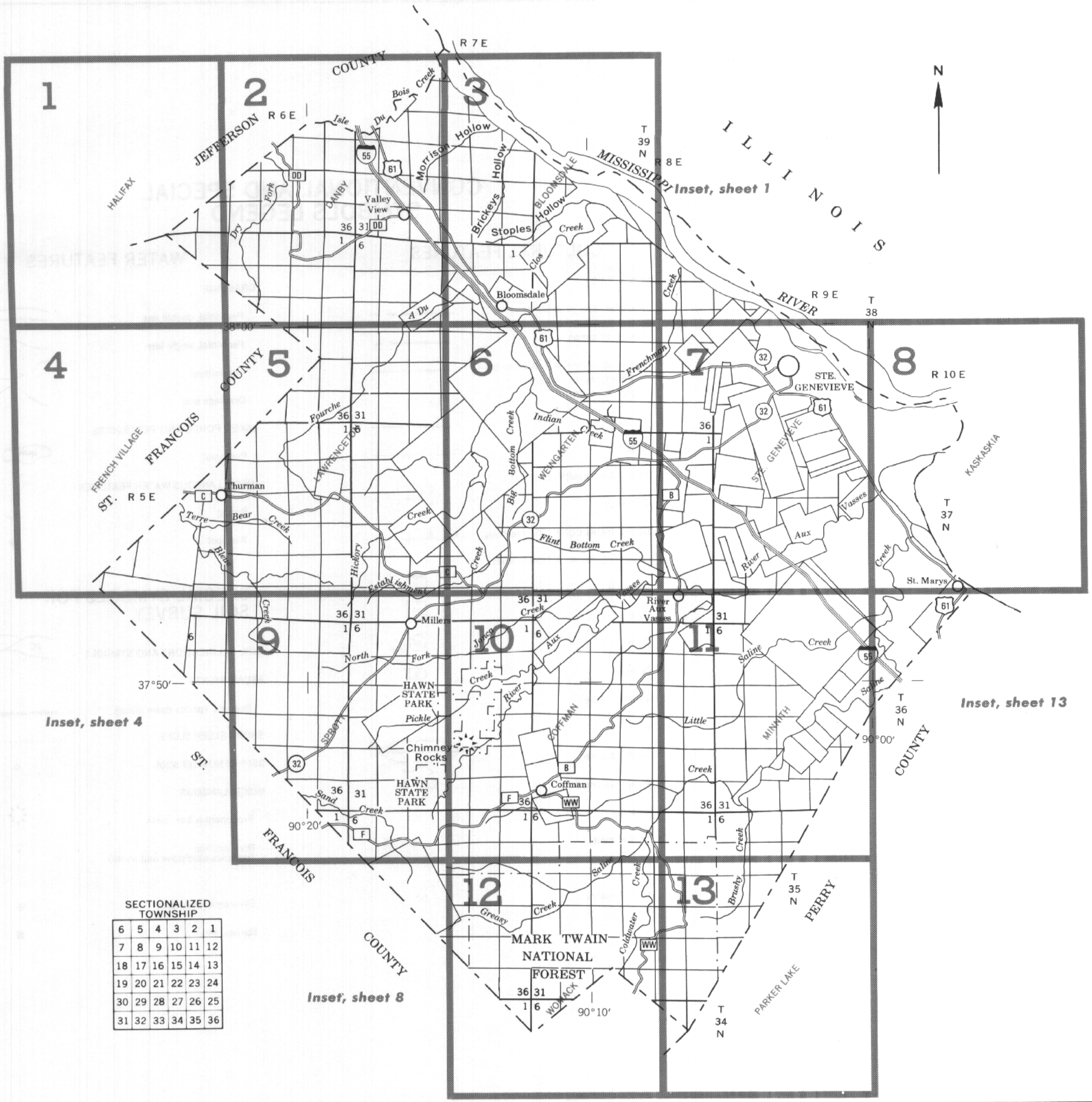
1 0 1 2 3 4 Miles

1 0 4 8 Km

General Soil Map

Manuscript

Welcome Page



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

STE. GENEVIEVE COUNTY, MISSOURI

Scale 1:273,989

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is eroded.

SYMBOL	NAME
1C	Lamotte silt loam, 5 to 9 percent slopes
1D	Lamotte silt loam, 9 to 14 percent slopes
2C	Caneyville silt loam, 3 to 9 percent slopes
2D	Caneyville silt loam, 9 to 14 percent slopes
2E	Caneyville stony silt loam, 14 to 20 percent slopes
7C	Jonca silt loam, 3 to 9 percent slopes
8C	Hildebrecht silt loam, 3 to 9 percent slopes
8D	Hildebrecht silt loam, 9 to 14 percent slopes
11C	Union silt loam, 3 to 9 percent slopes
12E	Goss cherty silt loam, 14 to 35 percent slopes
14C	Minnith silt loam, 3 to 9 percent slopes
14D	Minnith silt loam, 9 to 14 percent slopes
15F	Goss-Menfro complex, 14 to 45 percent slopes
16C	Menfro silt loam, 3 to 9 percent slopes
16D2	Menfro silt loam, 9 to 14 percent slopes, eroded
16E2	Menfro silt loam, 14 to 20 percent slopes, eroded
17C	Menfro silt loam, karst, 2 to 14 percent slopes
17E	Menfro silt loam, karst, 9 to 35 percent slopes
18F	Gasconade-Menfro complex, 14 to 50 percent slopes
19C	Crider silt loam, 3 to 9 percent slopes
19D	Crider silt loam, 9 to 14 percent slopes
20B	Fourche silt loam, 2 to 5 percent slopes
20C	Fourche silt loam, 5 to 9 percent slopes
21C	Nicholson silt loam, 3 to 9 percent slopes
22E	Wilderness cherty silt loam, 14 to 30 percent slopes
23B	Gerald silt loam, 1 to 4 percent slopes
25A	Auxvasse silt loam, 0 to 3 percent slopes
34C	Weingarten silt loam, 3 to 9 percent slopes
34D	Weingarten silt loam, 9 to 14 percent slopes
39D	Lily loam, 9 to 14 percent slopes
40E	Ramsey stony loam, 14 to 35 percent slopes
41E	Gasconade stony silty clay loam, 9 to 35 percent slopes
43E	Syenite very bouldery silt loam, 14 to 35 percent slopes
50A	Ashton silt loam, 0 to 3 percent slopes
52A	Freeburg silt loam, 0 to 3 percent slopes
64	Carr fine sandy loam
65	Ross silt loam
66	Haymond silt loam
67	Wilbur silt loam
70	Beaucoup silty clay loam
81A	Midco cherty silt loam, 1 to 3 percent slopes
82A	Bloomsdale silt loam, 0 to 3 percent slopes
83	Wabash silty clay
93	Pits-Orthents complex
94	Dumps, mine
424	Haynie silt loam
590	Nameoki silty clay loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Neatline

AD HOC BOUNDARY (label)

- Cemetery

LAND DIVISION CORNERS (sections)

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 55
- Federal — 61
- State — 44
- County — U

RAILROAD (label)

DAMS

- Large (to scale)
- Medium or small — w

LEVEES

- Without road

PITS

- Mine or quarry

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w

MISCELLANEOUS WATER FEATURES

- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 2C 7C

ESCARPMENTS

- Bedrock (points down slope)

SHORT STEEP SLOPE

DEPRESSION OR SINK

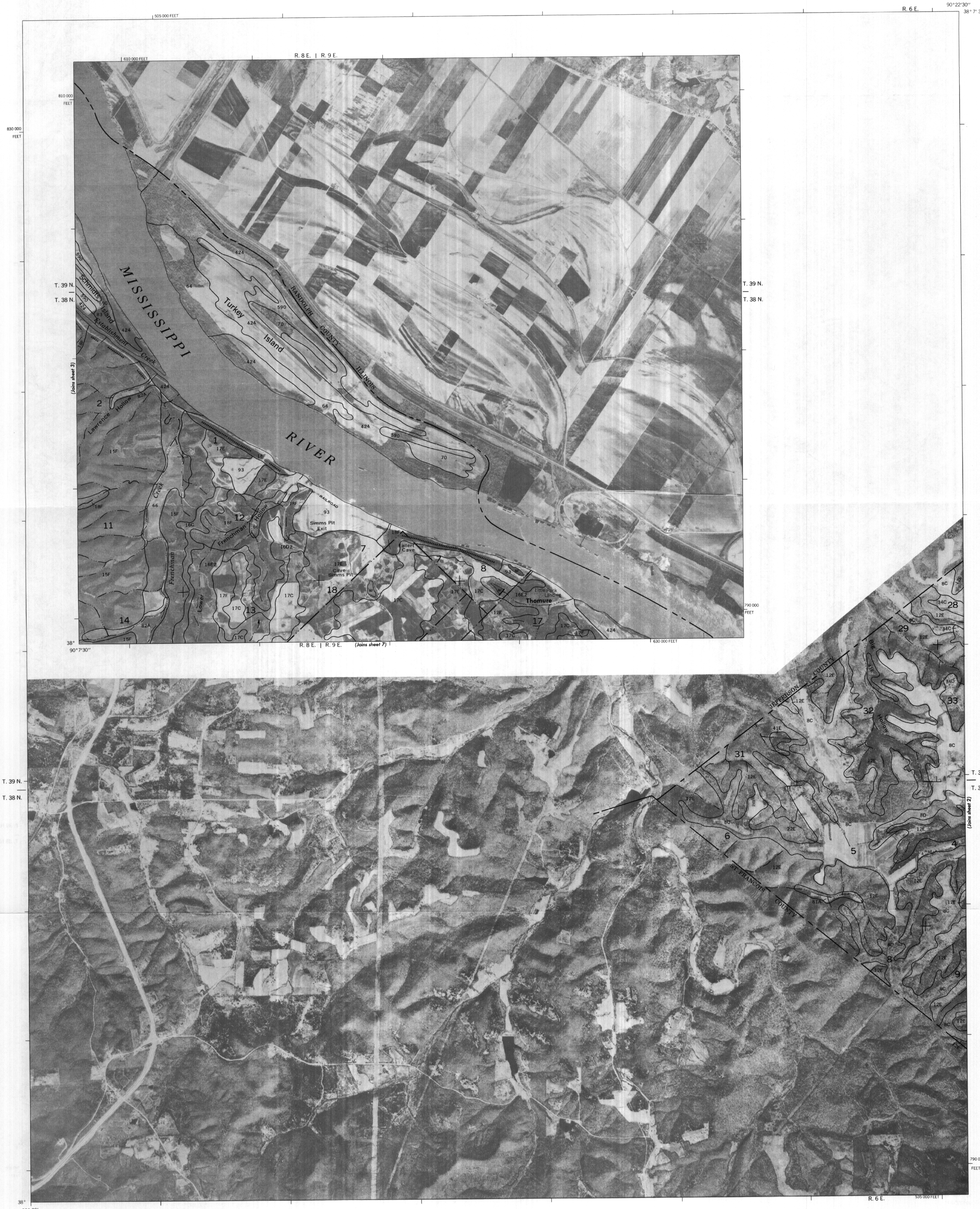
MISCELLANEOUS

- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Severely eroded spot
- Borrow pits

Index Map Welcome Page Manuscript

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
STE. GENEVIEVE COUNTY, MISSOURI
(HALIFAX QUADRANGLE AND PART OF PRAIRIE DU ROCHER QUADRANGLE)



This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1980 orthophotography obtained from U.S. Department of the Interior, Geological Survey.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

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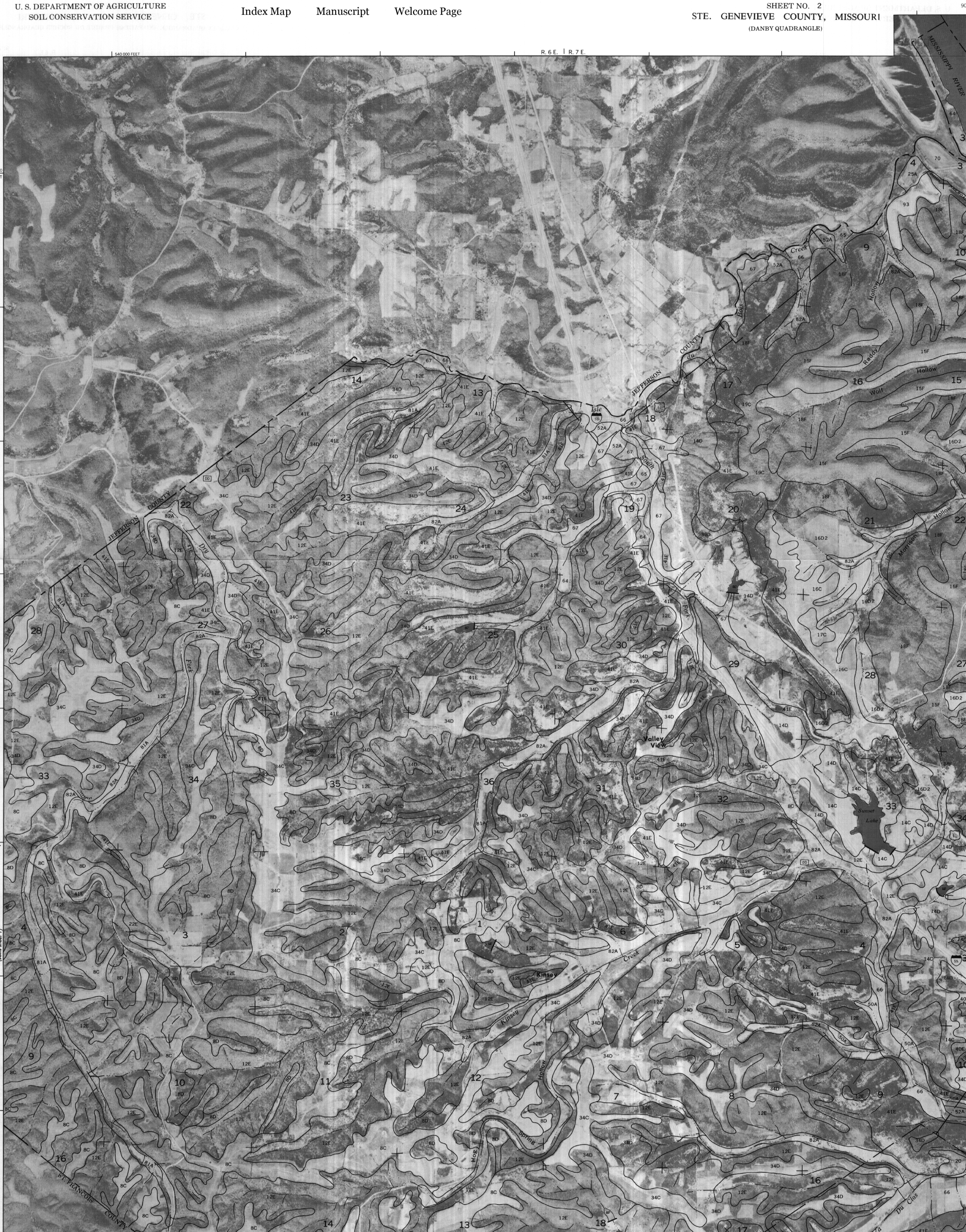
Index Map Manuscript Welcome Page



This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1980 orthophotography obtained from U.S. Department of the Interior, Geological Survey.

Scale 1:24000

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

N

STE. GENEVIEVE COUNTY, MISSOURI NO. 2

3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

N

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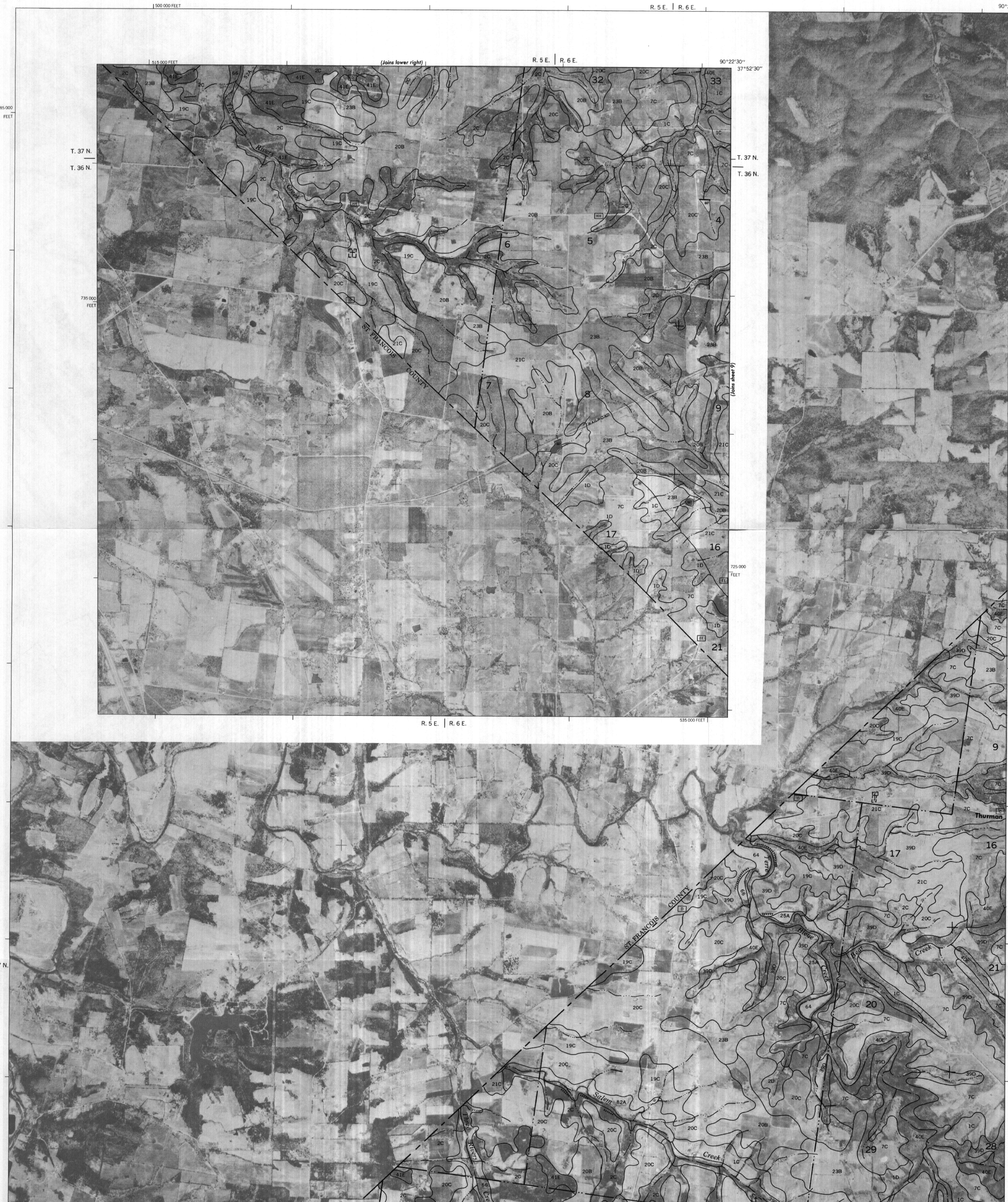
SOIL CONSERVATION SERVICE

Index Map   Manuscript   Welcome Page

STE. GENEVIEVE COUNTY, MISSOURI

(FRENCH VILLAGE QUADRANGLE AND PART OF FARMINGTON QUADRANGLE)



1   3/4   1/2   1/4   0   1   2 MILES

1   0.5   0   1   2 KILOMETERS

Scale 1:24000

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N

STE. GENEVIEVE COUNTY, MISSOURI NO. 4

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

N

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1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

Scale 1:24000

N

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1980 orthophotography obtained from U.S. Department of the Interior, Geological Survey.

N

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24 000

N

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SOIL CONSERVATION SERVICE

Index Map Manuscript Welcome Page

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

N

STE. GENEVIEVE COUNTY, MISSOURI NO. 9

3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

Scale 1:24 000

N

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

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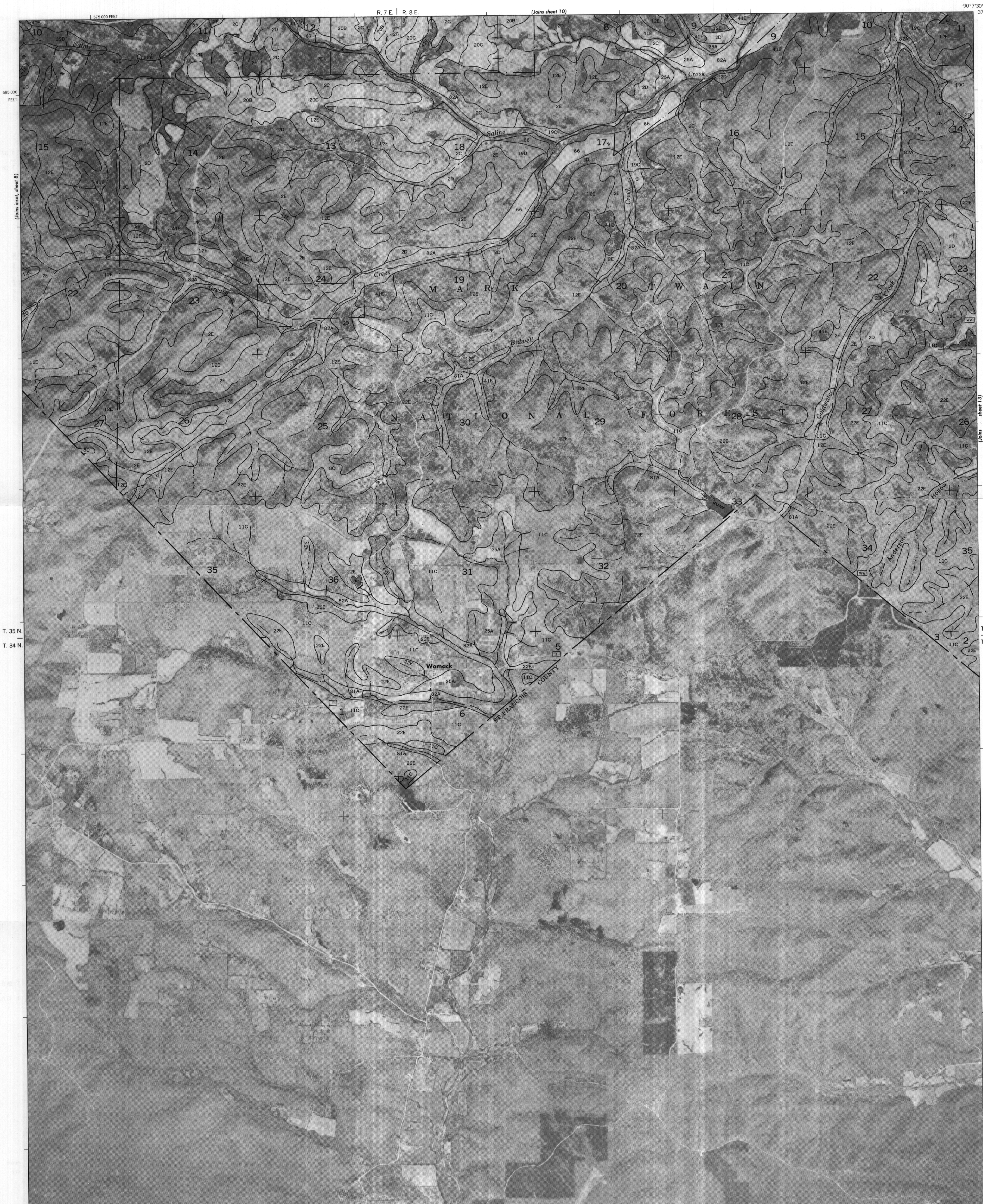
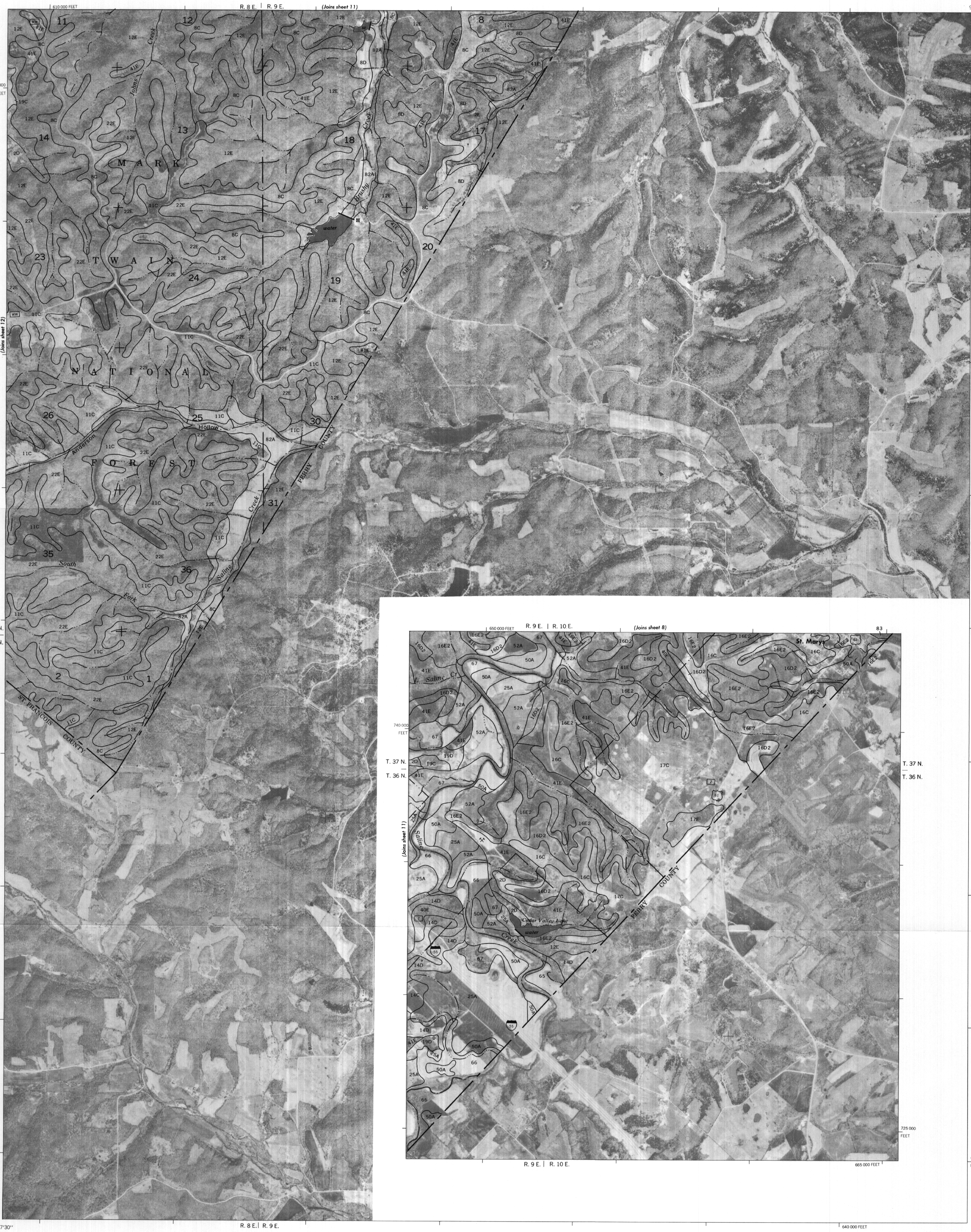
STE. GENEVIEVE COUNTY, MISSOURI NO. 11

N



This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1980 orthophotography obtained from U.S. Department of the Interior, Geological Survey.

Scale 1:24000



1	3/4	1/2	1/4	0		1		2 MILES
	1		0.5	0			1	2 KILOMETERS

Scale 1:24000

N

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